AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

VOL. 3, No. 42. WEEKLY. | NEW YORK, OCTOBER 16, 1880. | $3.00 per Annum SINGLE COPIES, 6 CENTS.

COPYRIGHT, 1880, BY AMERICAN MACHINIST PUBLISHING COMPANY.

Hydraulic Forging at Edge Moor.

BY ROBERT GRIMSHAW, PH. D.

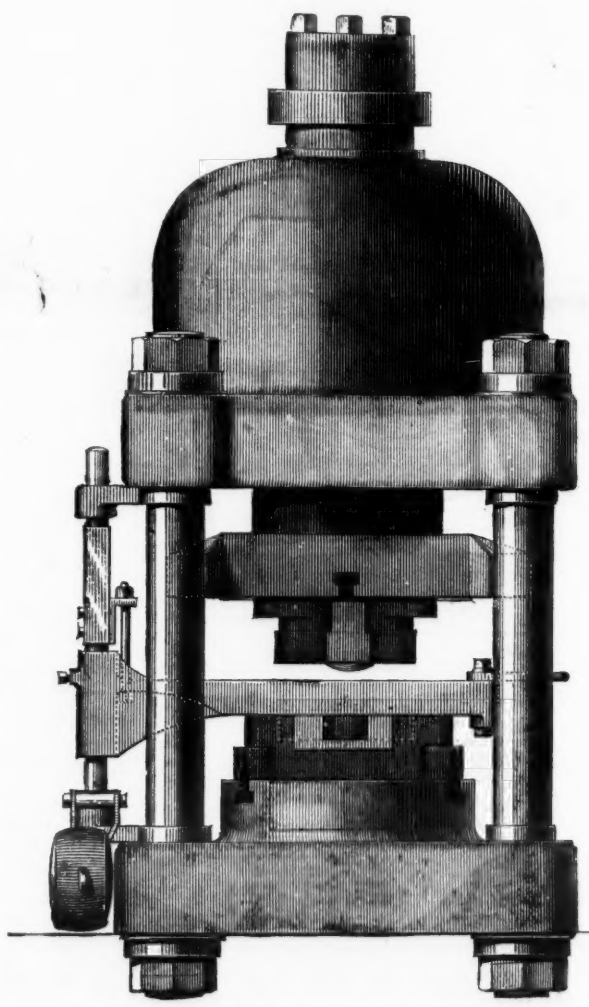
As one principal reason for the superiority of forgings over castings is their continuity of fiber as opposed to crystalline structure, so hydraulic die-forged crank shafts, eye bars, etc., are stronger than those anvil-forged and afterwards slotted or bored out, because they are given, at one operation, almost their finished shape, and the fibers can be made to lie more nearly in the line of strain

Hydraulic pressure gives greater interior compactness than hammer blows, and the time consumed is so much less, that not only the cost is lessened and output increased, but the objects, being finished at one operation, do not require reheating. Die forging also insures uniformity and accuracy of dimensions.

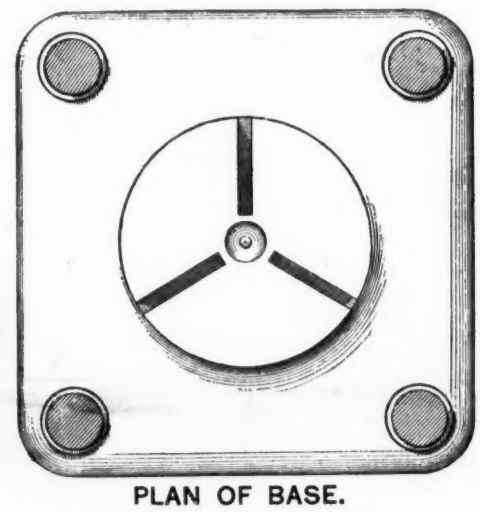
Visitors to the Vienna and the Paris Expositions will remember the locomotive driving wheels, link quadrants, and inside crank shaft, etc., hydraulic-forged by Haswell, of Vienna. As one of our principal manufacturing establishments, the Edge Moor Iron Works, near Wilmington, Del., has put up at great cost the plant required for hydraulic forging, and have for some time been successfully making, by this process, all the eye bars required in their iron bridge work, besides some other articles requiring careful forging, I have been at the pains to gather, from personal inspection of the works, the principal details of the process and plant.

I may properly divide the subject into (1.) Hydraulic Compressors and Accumulator. (2.) Furnaces and accessories. (3.) Forging apparatus proper.

At Edge Moor the water is compressed or, rather, put under pressure by two pump systems, the low and the high-pressure.

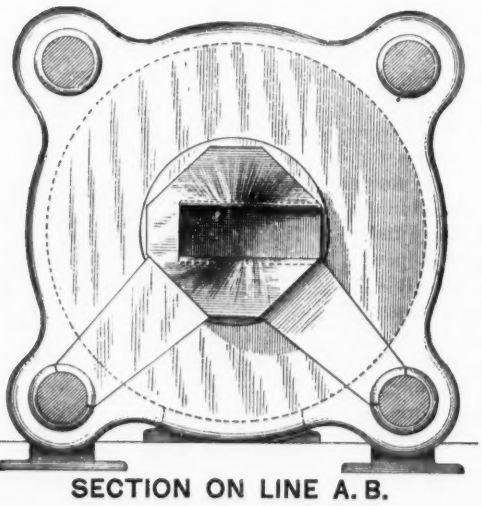


HYDRAULIC FLATTER.



PLAN OF BASE.

HYDRAULIC FLATTER.



SECTION ON LINE A. B.

HYDRAULIC UPSETTER.

The low-pressure water is furnished by a Worthington duplex direct-acting pump of ten-inch (10″) stroke, the steam and water cylinders being respectively twelve (12) and three and three-eighths ($3\frac{3}{8}$) inches in diameter, giving areas, say, 12 to 1, and usually taking steam of 70 lbs. boiler pressure.

The accumulator, receiving water from this pump, has a stationary piston ten inches (10″) diameter, and movable vertical cylinder, loaded with cast-iron blocks of about 100 lbs. weight each, and generally carrying 500 lbs. per square inch on the water therein.

The high-pressure water is furnished by a vertical compressor, having Blake cylinder and valve motion, and Sellers' pump cylinder. The stroke is nine inches (9″), and the cylinder diameters sixteen (16) and two and one-eighth ($2\frac{1}{8}$) inches respectively. (Areas of 256 to 3.5466, or, say, 72 to 1.)

The steam admission is regulated automatically by the rise and fall of the accumulator piston.

The high-pressure accumulator (which has the piston movable and cylinders stationary) carries a load of movable weights by which the pressure, at will, may be varied from six hundred and twenty-five (625) pounds up to four thousand (4,000) pounds per square inch. The weights are readily taken on or off by moving down the piston and inserting or removing cross pins in vertical bars attached to it. The accumulator pistons are of wrought iron, cased with seamless brass tubing.

The improved double-acting force pump, referred to, has but one acting valve. The piston area is double that of its rod. On the up stroke a cylinder full of water is drawn in, and half a cylinder full expelled by the rising piston. On the down, a cylinder full is displaced by the piston, but half of it goes to the upper end of the cylinder, thus sending half a cylinder full to the accumulator.

The Sellers' Ponsard regenerating furnace has double circulation of waste gases and heated air, the air passing upwards as it is heated, and the waste gases downwards as they lose part of their heat. The front and doors have proper water circulation.

We will suppose a ten-inch (10″) head to be made on a five-inch (5″) bar. Instead of upsetting the bar to form the head, thus crippling the fibers, separate five-inch pieces are piled on the bar end, and the whole, when at a welding heat, put into the Hydraulic Upsetting machine which has four (4) hydraulic press cylinders. Two vertical twelve inch (12″) cylinders press the piled mass between flattening dies; one small one in front, at the bottom of the machine, has two pistons actuating levers, which grip the cold portion of the bar, and prevent its being pushed out by the upsetter. The fourth 24″ horizontal ram at the back of the machine upsets the heads.

The heads formed in this operation have the fibers unruptured and lying around the eye, so that they are stronger than ordinary eyes, and hence the pear-shaped form is not used; the round head being strong enough to break the bar and easier to make and maintain dies for. The cross bar section is 50 per inch in excess of the bar area.

The upsetting machine has three valves, one for the 500 lb. water, used in the first part of the operation, one for the high pressure water which gives the finishing pressure, and one for the exhaust.

The Dies are usually made of close cast iron, wrought iron scraps being sometimes thrown in the cupola to toughen the metal. Some are of charcoal car wheel pig; some of wrought iron, and some of steel. In some cases the male is of low steel, and the female of cast iron. To prevent bursting they are sometimes hooped with wrought iron bands shrunk on.

Herewith is given sketches of a pair of male and female flattener dies. (See page 2.)

The largest eye bar made at these works, has a 20″ eye on a 9″ bar.

Previous to heating, the flat bars are straightened in a reciprocating machine, driven by an overhead wire rope on a 6 ft. pulley, making 120 revolutions per minute, or say 2,250 lineal feet of belt speed per minute. As it is important that the distance between eye centers be accurate and uniform, the bar, while having the second end forged, buts against a stop on a wrought iron beam, graduated in inches and portions measured on the center of the flatter dies. An allowance of $\frac{5}{8}$″ is made for the expansion of the 4 feet of heated portion. If the bar be forged too long by mistake, it must be upset hydraulically, if too short, a sufficient piece is piled between the center and the eye, to keep the section the same after drawing out under the press.

To insure the eyes being spaced accurately between centers, both ends are drilled at once, the drill press traveling on a long cast iron table, to which are bolted two graduated side pieces, which are of wrought iron, so as to expand equally with the bars. These last having been allowed to lie beside the borers long enough to acquire the same temperature, the distance is set off by a vernier and the operation done at both ends simultaneously. By this means winter-bored bars may be made of exactly the same length as those drilled in summer.

The bars are lifted and run about by an overhead carrier, operated by a wire rope driver by a hydraulic cylinder.

Railway drawbars are hydraulically upset and forged in two halves, and then welded together, by a simple squeeze in the "flatter." One piece is piled on before upsetting and five after.

Right and left hand sleeve nuts are forged from flat plates rolled up lengthwise, to bring the fiber right, the enlarged cylindrical central part of the bore being done by using a large mandrel first for the center, and a small one for the ends, which are to be screwed.

Clevises are forged in separate halves, and afterwards welded together.

U nuts are brought right up from the flat plate. As yet the Edge Moor Works have

not attempted hydraulically forging crank shafts, as their attention has been too fully occupied with bridge work.

They flange boiler heads hydraulically by one pressure in the flatter, instead of reheating and hammer flanging by hand.

The hydraulic plant of the Edge Moor Works, used in the forging shop, comprises, two (2) flatters of 24″ and 12″ rams, respectively.

Two (2) upsetters with main rams 24″ and 13″ diam., respectively.

One (1) shears 12″ cylinder, cutting off up to 2″ in diam., cold.

One (1) overhead hydraulic crane.

In the erecting and boiler shops all riveting is done by hydraulic pressure, there being in use five machines of the Sellers Tweddell system. The cranes are also hydraulic.

Dry Plumbago vs. Tallow and Oils in Steam Cylinders.

[Reprinted by request from American Machinist of December, 1878.]

BY WILLIAM J. WILLIAMS.

Ever since the invention of the steam engine, the lubrication of the cylinder and piston has been attended, in most cases, with serious drawbacks, caused by the character of the lubricants used, or the changes which they undergo when brought in contact with steam. Tallow and animal oils, until within a very few years, were the only lubricants in use, sometimes supplemented with a little ground plumbago. Of late years, preparations of mineral oils, under various names, have come into use in some places. The writer of this article, an engineer of some years' standing, seeing and feeling, as it were, the bad effects of both tallow and oils on the engines of which he has had charge, it became a very important question to him whether there was not something that would do the work required without destroying the piston, joints, and valve faces.

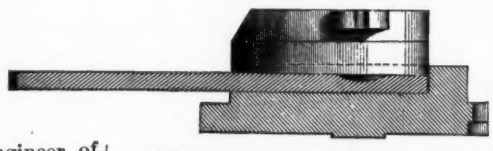
Having heard of the application of dry plumbago, with success, it was concluded to give it a trial. The engine upon which the experiment was carried on was an 11x30 horizontal engine; piston speed, 300 feet per minute, and was known as the "West Poppet-Valve, Automatic Engine." It was worked up to its full capacity, and, to insure a fair trial, the existing oil-cup was exchanged for a goblet-shaped tallow-cup with a lid, after which the piston-follower and springs were taken out and cleaned. When ready to start the engine, one-third of an ounce of finely powered Ceylon plumbago was placed in the cup. As soon as the engine was fairly under way, the valve of the grease-cup was opened half way. After running some time it was opened all the way. When the engine was stopped at noon, on examination of the grease-cup, the plumbago had all passed into the cylinder, of which there had been strong evidence, soon after starting, as the piston-rod became coated with it. Upon starting up in the afternoon one-third of an ounce more was placed in the cup, and the engine run until six o'clock, with a similar result. There was no noise in the cylinder, either in the starting, running, or stopping of the engine; and after eighteen months' use, with the above-named quantity applied twice a day, no noise has been heard in the cylinder, except when the steam was shut off for the purpose of stopping the engine, when it would be heard during one or two strokes of the piston, just before the engine stopped. This occurred not oftener than would have taken place if tallow or oil had been used. Soon after beginning its use, a portion of the plumbago would be found remaining in the cup; to obviate this, about an ounce of water was poured into the cup, after the plumbago had been put in, when a decided improvement was observed, so much so, that it can now be fed into the cylinder as readily as oil or tallow. After four weeks' use, the cylinder head was taken off and the working part of the cylinder was found coated with plumbago which could not be easily rubbed off with the fingers; the interior of the piston was found as clean as when it left the lathe, so far as dirt of any kind was concerned, and such is the condition to this day.

The gum joints (six in number), connecting the stuffing-box bonnets, valve-seats, and steam-chest to the cylinder, had been renewed a few days before the new lubricant had been applied; they are in perfect condition to-day, showing no signs of leakage; whereas, if oils or tallow had been used, they would have had to be renewed twice in that time. As to choking up of passages, from past experience, there seems to be no need of apprehension, and so satisfactory have been the results that the old-style lubricators will not be resorted to soon again.

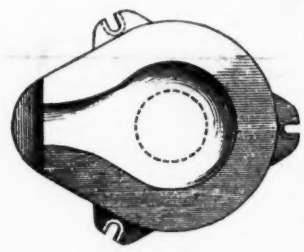
Now, as atoms make up the mass, and drops fill up the ocean, I thought, perhaps, this slight contribution might add something to the general stock of information on the subject of lubricating steam cylinders.

The lumber and building trades of the country are now in a highly prosperous condition. Prices of materials are appreciating, and so is real estate. This betokens good business in other occupations.

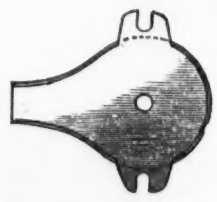
DIES FLATTENING EYE.



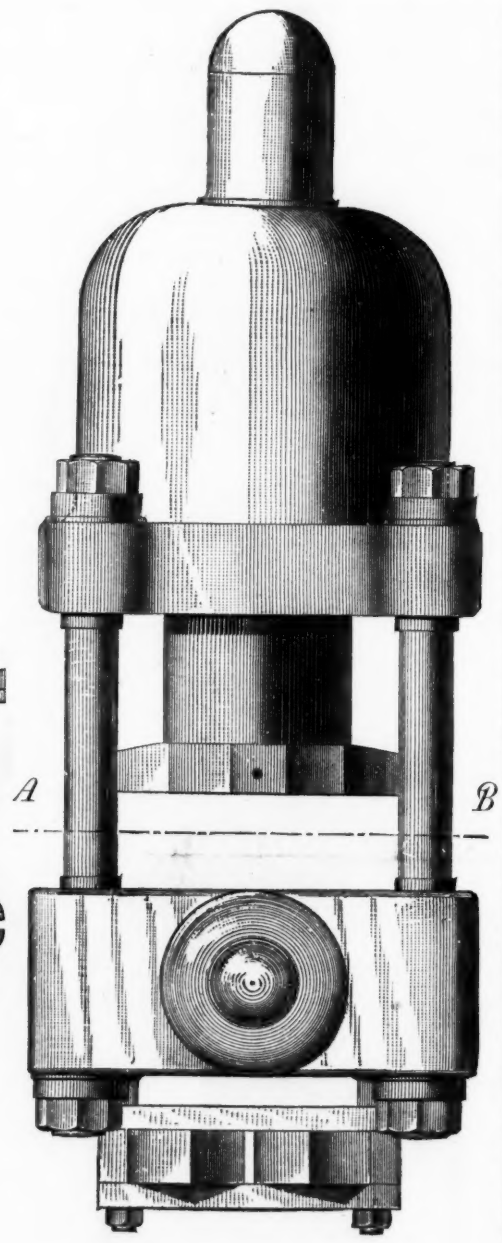
FEMALE DIE IN SECTION.



PLAN OF FEMALE DIE.



PLAN OF MALE DIE.



PLAN OF HYDRAULIC UPSETTER.

Plumbago as a Lubricator.

BY WM. J. WILLIAMS.

My first communication to the American Machinist gave the results of the use of dry plumbago as a lubricator in a steam cylinder. I have nothing to retract from what was then stated; but—is plumbago a universal lubricator? As this mineral is never omitted in the list of substances for the cooling and curing of hot journals, and is by many thought superior to anything else used for that purpose, some account of its qualities as a lubricator under certain conditions may be of interest.

In order to give conditions, a description of a machine and its purpose will be necessary. The machine in question, was a chaser, its use to powder plumbago. It consisted of a vertical shaft with a pair of arms on which the chasers revolved, so constructed as to move up and down freely on the said shaft. To accommodate any difference in quantity of stock between bedstone and chasers, motion was imparted to the chaser arms by a driver keyed to the vertical shaft, the driver being in contact with the arms between chasers and shaft. The whole was set in motion by a pair of bevel-toothed wheels.

The chasers were of cast iron, 3 feet in diameter, 7 inch face; weight of each 1200 lbs.; speed 40 revolutions per minute; length of chasers' hubs 9 inches; diameter of those portions of the arms on which chasers revolved 2¾ inches. The outer ends of the hubs were faced in a lathe. The chasers were kept on the arms by a cast iron collar (also faced) as large in diameter as the hubs of chasers, which were nearly 8 inches. Between them was placed a washer, said to be compressed wood or paper, full size of hubs and collars.

It was intended to lubricate with oil, and to provide for this a hole was bored diagonally across the thickness of the chasers, reaching points on the arms rather more than half the length of working parts of the arms. The outer ends of the holes were tapped and plugs inserted in them to prevent the oil from being thrown out when the chasers were at work.

There is an old proverb which says, "Man proposes but God disposes." The working result of this machine was, that as soon as any impalpable powder was made it found its way inward along the arms, filling up the oil holes so compactly in a few hours running, that it could scarcely be pierced by a sharp pointed rod of iron, kept for the purpose of endeavoring to dig the plumbago out. In a few weeks one chaser had worn its arm so much that it no longer stood plumb. It cut through the washer and scooped out the upper part of collar. The other was fast following the same result. The collection of plumbago around the toe of vertical shaft quickly soaked up any oil that was placed in the step. Every part of the machine bore strong evidence of the presence of plumbago but the working parts; these were as innocent looking of ever being lubricated with anything as a bar of iron in a dealer's storehouse.

After much consultation it was decided to repair the arms, bore out the hubs of chasers large enough to insert a bushing of cast iron, having in the middle of its length, by enlarging the diameter of the hole through it, a chamber which held about half a pint of oil. To lubricate the arms, and for its introduction, a hole was bored through the chasers, hubs and bushings.

When the chambers were filled with oil, the outer end of oil hole was sealed with half-inch gas plug. The ends of all the chasers' hubs next the vertical shaft were provided with stuffing boxes, and packed with plaited hemp gaskets. The opposite ends of the hubs were provided with hardened steel washers, revolving with the chasers and working against others, held stationary by a steel pin through ends of arms, which also prevented the chasers from coming off their respective arms. Upon the outer end of each chaser was a cylindrical-shaped cup, fastened to them by four bolts forming an oil chamber for the lubrication of the washers within them. Each would hold about a pint of oil. These were filled through a hole provided for the purpose, which was also closed by a half inch gas plug. Every provision was made to keep out the plumbago and for retention of the oil, but it proved to be impossible to keep the former from working its way along the arms and filling up the oil receptacles, and instead of lubricating the surfaces with which it was in contact, it cut the bearings as badly as if sand or emery had been introduced.

Every few days the chasers would have to be taken off their arms and the plumbago dug out of the oil chambers (those at the ends would become as full of it as those within the hubs), when they would be replaced and stuffing boxes repacked. It was found that, until a certain quantity had entered, if strong soap suds were substituted for oil they would work better, less heat being generated in the journals, as indicated by a thermometer placed against that part of hubs bearing against the washers, after the same number of hours run. This would seem to indicate that plumbago and soap suds constitute a better lubricator than oils and plumbago. Different kinds of oils were experimented with.

As to the quality of the plumbago being powdered, both Ceylon and American were experimented upon, and so far as the eye could detect, there was no foreign matter contained in either. It was a matter of astonishment to all who saw the results—how it was possible that the working parts of the machine could be cut and grooved, as they were, when literally buried in an article universally considered a first-class lubricator.

Now, observe the contrast between the above machine powdering a lubricator and another machine, used as a dusting chaser for powdering medicinal roots and herbs; having stone chasers 2 feet high, 1 foot wide at their faces, and a speed of 80 revolutions per minute. In all other particulars the two machines were built precisely alike. No cutting, grooving, or heating was ever experienced with the latter. No attention beyond filling the oil chambers about twice a week was ever needed, and yet it run for years with entire satisfaction, while the other machine was practically renewed three times in one year.

It has been claimed by some that they have done all their lubricating of shafting, and even the slides of steam engines with dry plumbago with good results; but our experience with it was, that if the article had never been present, the journals would have been in much better condition, for it would seem that oil and plumbago together, whether mixed intentionally or not, do not make a lubricator to be depended upon, but together form a hard gritty substance after a little running.

The *Diaro Official* has notices of the progress of seven or eight railroads in Mexico.

Newly Incorporated Massachusetts Companies.

The Entre Rios Eastern Railway Co., Boston, T. Haskins DuPuy, W. S. Greene, J. B. C. Drew, Henry J. Davison, P.P. Dickinson, John H. Hardy, Henry W. Bragg, Charles B. Southard, Rodney J. Hardy, Directors. Capital, $2,500,000, in shares of $100 each. To construct, maintain, and operate a railroad and telegraph in the Province of Entre Rios, of the Argentine Republic, from Gualeguaychü to Concordia, passing through or near the cities of Puerto Echagüe, Conception del Uruguay, and Colon. Sept. 22.

Fall River Gas Works Co., Fall River, Jefferson Borden, Pres., Rob't C. Brown, Treas. Capital, $288,000, in shares of $100 each. For the manufacture and sale of gas, and also for the manufacture and sale of steam, gas and water pipe fittings and fixtures. Sept. 25.

Fall River Machine Co., Fall River, Jefferson Borden, Pres., Rob't C. Brown, Treas. Capital, $96,000, in shares of $100 each. For the manufacture of engines, boilers and machinery, and the sale thereof. Sept. 25.

Fall River & Providence Steamboat Co., Fall River, Jefferson Borden, Pres., Rob't C. Brown, Treas. Capital, $192,000, in shares of $100 each. For the transportation of passengers and freight between Fall River, Bristol, Providence, and other ports in Rhode Island, Massachusetts, and on the Long Island Sound. Sept. 25.

Atlas Horse Nail Co., Boston, James Alexander, Pres., Wallace L. Broadbent, Treas. Capital, $100,000, in shares of $100 each. For manufacturing horse-shoe and other nails, dealing in patent rights pertaining thereto, making, selling and using machines connected therewith, and licensing others to make, sell and use the same. Sept. 28.

Metacomet Manufacturing Co., Fall River, Jefferson Borden, Pres., Rob't C. Brown, Treas. Capital, $288,000, in shares of $100 each. For the manufacture and sale of goods, wholly or in part wool, cotton, silk, flax, hemp or jute. Sept. 25.

Syms & Dudley Paper Co., Holyoke, Wm. Whiting, Pres., Geo. E. Dudley, Treas. Capital, $100,000, in shares of $100 each. For the manufacture and sale of paper, paper stock and supplies. Sept. 28.

National Carbureter Corporation, Boston, James M. Palmer, Pres., Thos. L. Rogers, Treas. Capital, $100,000, in shares of $100 each. For manufacturing, selling, using and leasing carbureters, and selling or licensing the right and authority to do the same. Sept. 28.

Westcott's New Lathe Chuck.

The engravings shown herewith represent a new geared chuck, designed by J. H. Westcott, with details, which possesses some new and valuable features. The chuck is shown complete in Fig. 1, which will give the reader a general conception of its practical value in holding work.

The jaws, having two holes each, are so constructed that they may be changed from one hole to the other upon the studs, or be reversed for holding different forms of work. It will be noticed that the holes for the studs are quite near the ends of the jaws nearest the work, which prevents the jaw from springing out when subjected to a strain, as in holding a piece of work. This plan also prevents the accumulation of lost motion between the jaw and the face of the chuck, which greatly impairs the accuracy of the work produced. A section of this chuck is represented by Fig. 2, which shows the screws and manner of attaching the jaws, which is effected by means of studs and nuts. The location of screws having pinions attached, all of which gear with a bevel-toothed ring, are also defined. This connection is so arranged that the jaws may, by a single movement upon the back, be moved simultaneously or independently, as circumstances require—the jaws occupying a concentric or eccentric position. This movement is effected by inserting a loose ring in the back or cover, as shown in Fig. 3, which exhibits an interior face view of one-half of the chuck, while Fig. 4 represents a face view of the other half. These parts are held firmly together by tap bolts.

The circular rack is made to turn freely within the back, and may also be moved in and out of gear with the pinions upon the screws. This is effected as follows: A thin loose ring is fitted loosely behind the circular rack. A stud is attached to this ring, and, being provided with a nut, is made adjustable in a curved slot through the back of the chuck. The loose ring, referred to, has milled recesses in it, which admit projections on the inside of the back, allowing the ring to move back when in a certain position, so as to throw the circular rack out of gear with the pinions. This movement will be readily understood by referring to Figs. 5 and 6.

Fig. 5 represents the pinion and rack in

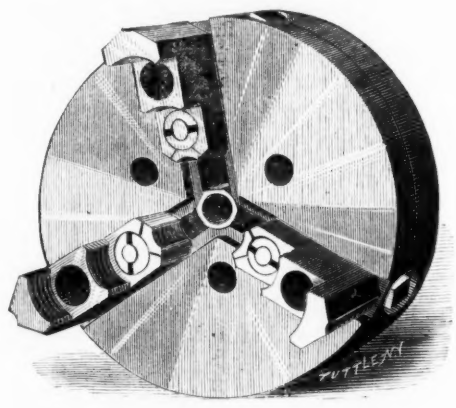


Fig. 1.

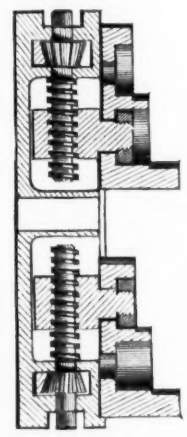


Fig. 2.

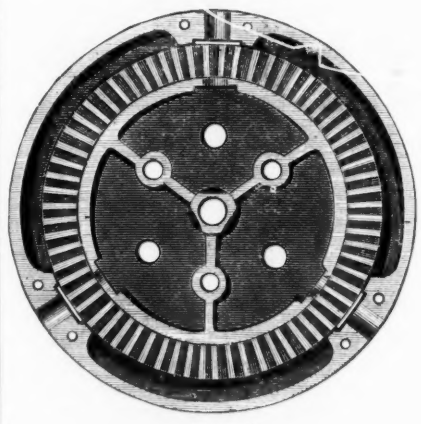


Fig. 3.

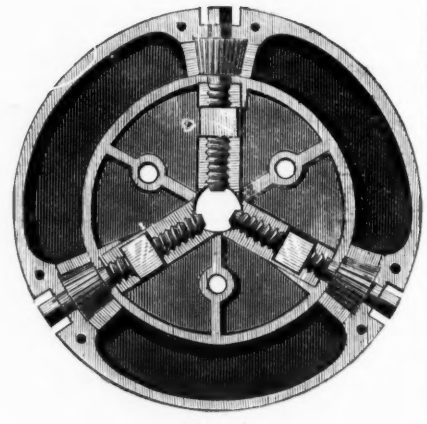


Fig. 4.

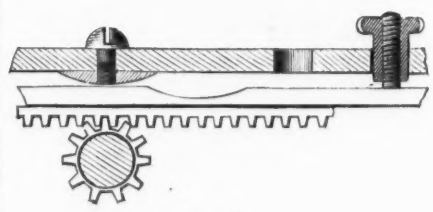


Fig. 5.

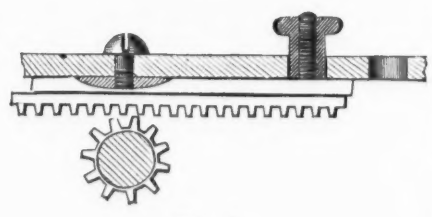


Fig. 6.

gear, and Fig. 6, the same thrown out of gear. It will be understood that the rack is firmly held in either position, thus making it very durable. This chuck is particularly adapted for holding drills and reamers, or holding intricate pieces of work. There are no projections, in the shape of screw-heads, to catch the clothing, or inflict any injuries upon the operator. Special jaws can be easily and quickly made when required for any particular class of work, which is a decided advantage. The different parts of this chuck are interchangeable, so that any part may be quickly duplicated. A 12 inch chuck will hold a piece of work 13¼ inches in diameter, without straining the jaws, which can be adjusted to about $\frac{1}{100}$th of an inch by moving the pinions one tooth. The castings are made as light as possible, consistent with the required strength. The new chuck is manufactured under the inventor's direction, by the Oneida Community, Oneida, N. Y.

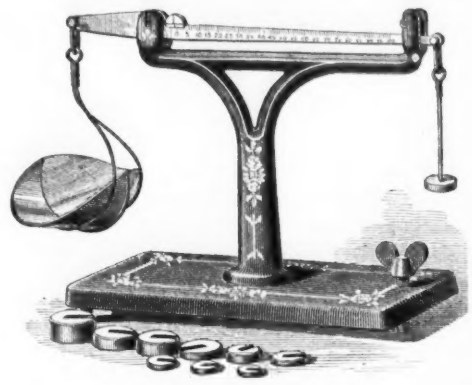
It is a curious fact that the locomotive which, with its train, went down with the Tay Bridge, is now running regularly between Glasgow and Edinburgh. For three months it lay in the bottom of the Tay, but when it was brought up it was found uninjured except the funnel, dome and weather dome, which had to be renewed. She ran on her own wheels to Glasgow just as she came out of her long bath.

The citizens of Salem, N. J., have decided, by a majority of 400, to have water works and a pumping engine. A committee has been appointed to visit and inspect the several systems of water works.

Sealed proposals are asked for by the Department of Public Works, Chicago, up to October 18th, for the construction and erection of pumping machinery complete, having a capacity sufficient to deliver 60,000 cubic feet of water per minute, 8 feet high, from the south branch of the Chicago River into the Illinois and Michigan Canal, according to specifications, a copy of which will be furnished on application to Chas. S. Waller, Commissioner of Public Works.

The Stevens battery was sold at auction in Hoboken, N. J., Sept. 29th; the hull for $55,000, and the machinery (in eight lots) for $11,000, making $66,000 in all. Three years ago $125,000 was offered for the battery.

About thirty-five of the construction hands on the Lexington and Big Sandy railroad, struck the other day for higher wages, demanding $1.25 per day. They have been receiving $1 and boarding themselves. The contractors proceeded to negotiate for convicts and others to supply their place.



Sample Weighing Scale.

The practical engineer and machinist often labors to a great disadvantage for the want of a scale in compounding a small quantity of metal, or in estimating large quantities. In making an analysis of boiler deposit and scale, besides hundreds of other small articles and substances, the chief trouble has been, that most of the scales for accurate weighing have been too expensive for ordinary use. The Brown & Sharpe Manufacturing Co., Providence, R. I., have, for some time, manufactured the scale shown in the illustration, which was designed particularly to supply the demand for a scale which would weigh accurately, and, at the same time, admit of a moderate neglect, without impairing any of its delicate parts. This scale will weigh one pound by ten thousandths of a pound. It may also be used as a postal scale, as well as numerous other purposes, which suggest themselves to those requiring a scale. The stand is made of cast iron, japanned and ornamented. The lever (which is nicely balanced upon hardened steel knife edges), as well as the other finished parts, are all nickel plated.

The scale is provided with nine balancing weights as follows, viz: One each respectively, of 100, 200, 400, 800, 1000, 2000, 4000 ten-thousandths, and also one-half ounce weight for postage weighing. The reader will readily understand how a pound and the fractions of a pound may be weighed and divided upon this scale by reading the following:

7000 Troy grains equal 1 lb. avoirdupois.
One 10,000ths of a lb. equals $\frac{7}{10}$ of a grain.

156¼	¼	ounce
312½	½	"
468¾	¾	"
625	1	"
2500	¼	pound
5000	½	"
7500	¾	"

A thumb screw is attached to the stand for accurate adjustment. This scale is well appreciated by those who use it.

Co-operative Life Insurance Statistics.

Just now, when the thoughts of so many individuals are being turned toward co-operative enterprises, among which mutual life insurance holds by no means the least place, the following statistics from the *Locomotive Brotherhood Engineers' Journal*, Cleveland, O., may be of value:

Assessments Nos. 419 and 420 were paid to the amount of $3,000 by 129 divisions, containing 1,515 members at a total cost for collection of $119.

Nineteen divisions had not yet reported. It will be seen from the above that the payments per member averaged a little less than two dollars, while the expense for collection was about eight cents per member.

A contract was made between the commissioners of the village of Addison, N. Y., and the King Iron Bridge Co., of Cleveland, O., for a bridge to span the Tuscarora creek in that village. The bridge was forwarded and has been found to be two feet too short. It has not yet been decided who is to blame, the agent of the bridge company, or the commissioners of the village, or those who put up the abutments.

Apprentice Papers.

BY CHORDAL.

V.—General Properties of Matter.

(CONTINUED.)

We have thus far considered only a few of the properties of matter, but they have been very important properties, a knowledge of which is necessary to the intelligent exercise of ordinary every-day operation with materials. Other properties of matter will be spoken of further along in these papers. We have looked into the structure of matter, and find that the peculiar arrangement of molecules in different substances give to those substances different qualities of *weight*, *hardness* and *strength*.

The properties of most all substances have been determined by practical scientific investigation, and it is thought well to insert at this point tables showing the different relative properties of different well-known substances.

WEIGHT OF DIFFERENT SUBSTANCES.

The following table shows the weight in pounds of a cubic foot of various common substances. From this table we can calculate the weight of any mass of any substance in the table, by first ascertaining by measurement and calculation how many cubic feet there are in the mass, and multiplying the result by the weight of a cubic foot of the substance:

Substance.	Pounds per cubic foot.
METALS.	
Cast iron	450.5
Wrought iron bar	486.6
Soft steel	489.8
Common brass	537.7
Wrought copper	555.
Cast lead	709.
Cast zinc	428.8
Tin	456.
Mercury, at 60°	848.75
Gold	1013.
Silver	551.
Antimony	422.
Aluminium	160.
Platinum	1296.
WOODS.	
Oak	55.
Ash	53.
Cork	15.
Cedar	35.
Chestnut	38.
Hickory	45.
Lignum-vitæ	83.
Mahogany	50.
Pine, yellow	34.
Spruce	31.
Walnut	31.
Willow	30.
MISCELLANEOUS.	
Air	.075
Brick	102.
Coal, soft	80.
Coke	62.
Pressed cotton	22.
Gutta percha	61.
Ice, at 32°	57.5
Moist Sand	128.
Common earth	137.
Gravel	126.
Glass, window	165.
Granite	165.
Grindstone	133.
Marble	169.
Millstone	155.
Mud	101.
LIQUIDS.	
Alcohol	50.
Milk	64.
Petroleum oil	55.
Water, rain	62.5
" Dead Sea	77.5

STRENGTH OF SUBSTANCES.

The following table shows the breaking strength of, or power in pounds required to pull apart, a bar one inch square of various common substances. The strength of any piece of any substance, shown in the table, can be found by measuring or calculating the number of square inches area of the piece and multiplying the result by the breaking strength of one square inch, as shown in the table :

Substance.	Pounds.
Wrought copper	34000
Copper wire	61200
Cast iron—American	31800
" English	19500
Iron wire	103000
English bar	56000
Boiler plate	50000
Cast lead	1800
Platinum wire	53000
Cast silver	40000
Bar cast steel	88000
Shear steel	124000
Cast tin	5000
Zinc, cast	3500
Hydraulic cement	234
Glass	2350
Gutta-percha	3500
Ivory	16000
Leather belts	330
White marble	9000
Mortar, good	60
Manila rope	9000
Hemp rope	15000
Wire rope	37000
Stone	350
Gold	40000
Brass	42000
Bronze, best	56800
Oak	10000
Boxwood	20000
Beech	19
Maple	14
Yellow pine	14
Cedar	13
White pine	11
Hemlock	8
Cork	5

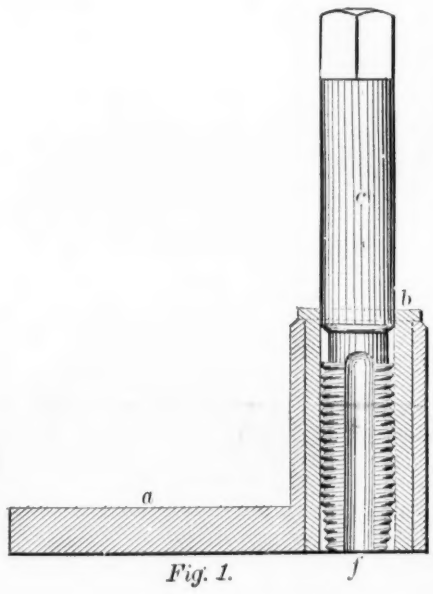


Fig. 1.

Fig. 2.

HARDNESS OF SUBSTANCES.

It is, of course, impossible to speak of hardness in pounds, or square feet, or anything of that kind. We can only compare the hardness of one substance with the hardness of another substance. Thus, we can say that chalk is half as hard as gold. It is best to take some one substance as a standard and compare other substances with it. Taking ormuz diamond as the standard, we find cork to be one-twentieth as hard. For convenience it is best to give the standard a value of one hundred, and express the hardness of other substances in hundredths of the standard. The following table shows the relative hardness of various substances, ormuz diamond being taken as the standard.

Substance.	Hardness.
Ormuz diamond	100
Agate	71
Quartz	70
Ruby	64
Granite	22
Chalk	15
Hard Steel	65
Unhardened steel	40
Cast iron	38
Wrought iron	37
Platinum	47
Common brass	32
Hammered gold	30
Hammered copper	34
Hammered silver	32
Zinc	26
Aluminium	24
Tin	24
Babbitt metal	20
Cast lead	15
Ebony	24
Boxwood	22
Oak, hard	22

Iron and Steel Excursion Steamboats.

The certificate of incorporation of the "Iron Steamboat Company," whose purpose it is to build a fleet of iron excursion boats intended for the navigation of the Hudson River, New York Bay, Long Island Sound, and other waters, was filed Sept. 28th, at Freehold, N. J. The incorporators are John Roach, the well known shipbuilder; Charles H. Cramp and Joseph C. Ferguson, of Philadelphia; Nathan G. Miller, of Bridgeport, Conn., and the following-named gentlemen of New York city: George S. Scott, of Scott, Leavitt & Co., bankers and brokers; Washington E. Connor, banker and broker; Samuel Carpenter, General Eastern Passenger Agent of the Pennsylvania Railroad Company; Charles E. Quincy, of the firm of William Heath & Co., bankers and brokers; J. B. Houston, President of the Pacific Mail Steamship Company; James D. Smith, of Jameson, Smith & Cotting, bankers and brokers; Alfred R. Whitney, iron merchant; William J. Hutchinson, of Kennedy, Hutchinson & Co., bankers and brokers, and Rufus Hatch, banker and broker.

The company is organized with the intention of building at once eight or nine steamboats, wholly of iron and steel, to ply between New York city, Coney Island, Rockaway Beach and Long Branch. It is believed that they will be much superior in safety to the wooden vessels now in use. Each of them will be divided into not less than 12 water-tight compartments, and provided with improved compound engines, steel boilers, and all appliances conductive to comfort, safety, and speed. It is designed to make them perfectly seaworthy, so that they can be sent for winter use to Savannah, Charleston, Florida, and New Orleans, and it is expected that their average rate of speed will be not less than 20 miles an hour. The company proposes to build 30 of these iron steamboats between now and 1883, the year of the proposed World's Fair. The total amount of the capital stock is $10,000,000, which is divided into 100,000 shares of the par value of $100 each. The sum of $800,000 has already been pledged, and subscription books are shortly to be opened. The business of the company is to be conducted at Long Branch and New York city. Its object, as specified in the certificate of incorporation, is "the building, furnishing, fitting, purchasing, chartering, managing, navigating, and owning of steamboats and other vessels, to be used and employed for carrying and transporting passengers and freight on the Hudson River, New York Bay, Long Island Sound, and other waters."

Shop Kinks, No. 1.

BY L. F. LYNE, M. E.

HOW TO TAP HOLES PROPERLY.

In visiting different shops and manufactories—railroad shops in particular—I have observed the different methods employed for tapping holes in a piece of work so that the screw or bolt to be inserted may stand directly at right angles to the surface. In railroad shops, when a man gets a job at tapping the stud holes in the flange of a cylinder, he gets the taps and wrench and a square. He then proceeds to start the taper tap into a hole. After giving it one or two turns he tries to find a surface upon which to place his square. This is a difficult matter, as the flange is narrow, and the projecting joint is generally from $\frac{1}{8}$ to $\frac{1}{4}$ of an inch wide. It is impossible to place a square against many of the taps in use on account of the projections, so the tap is straightened by the eye. Owing to these reasons, together with the probability that the flange is not faced off square, as is generally the case, the operation of tapping the hole square is matter of guess work. After the studs are in their places it is found necessary to chip out the holes in the cylinder head to get it over the studs, and, after succeeding, the head will fit only in one position, and cannot be interchanged.

I might enumerate many instances where it is impossible to use a square in squaring taps, but space will not permit; moreover, the complications mentioned are familiar to nearly every machinist. The accompanying illustrations represent a device for tapping holes square.

It consists of a flat piece of wrought-iron *a*, having a boss at one end. A hole is bored through the boss, the bottom having been previously faced off in a planer. A number of steel bushings, similar to *b*, are turned to fit the hole through the boss. The holes through these bushings are to admit different sized taps. The engraving represents a tap *c*, designed particularly for use with this device, but almost any style of tap can be used. It costs no more to have the taps made similar to the one illustrated, than of the designs now found in the market. Any tap that has a straight shank can be used by slipping a thimble (just the diameter of the top of the thread) over it; this will answer every purpose, and serve as a guide for the tap. It may be argued that should it be required to tap a deep hole, the shoulder back of the thread would prevent it. This may be true, but with the tap illustrated, a hole may be tapped of a sufficient depth, so that a second tap might be inserted with no danger of running crooked. To set this device directly over the center of the hole, a plug *d*, Fig. 2, is inserted through the bushing *b*, the end *e* being of the same size, as the end of the tap enters the hole drilled, thereby locating the device at once. A clamp may then be applied to hold it fast; after which, the plug *d* is withdrawn and the tap inserted. By this means holes may be tapped square with the surface; without any difficulty the work may be accomplished in much less time, and a man can work without paying particular attention to starting the tap right. A similar device has been in use for some years, but is generally made of solid iron, and a different tool is required for each size. With this plan, bushings can be made for one holder to fit a number of taps.

E. T. Jeffrey, General Superintendent of the Illinois Central Road, is making arrangements for running trains without the customary molestations by smoke. He believes that careful firing of the locomotive will do away with all smoke as effectually as do the patent smoke consumers.

Capital to the amount of over $6,250,000 is invested in Akron, O., industries, consuming nearly $4,740,000 worth of raw material each year, and turning out annual products valued at over $9,300,000; over 4,000 men are given regular employment, pocketing in wages over $1,250,000 a year.

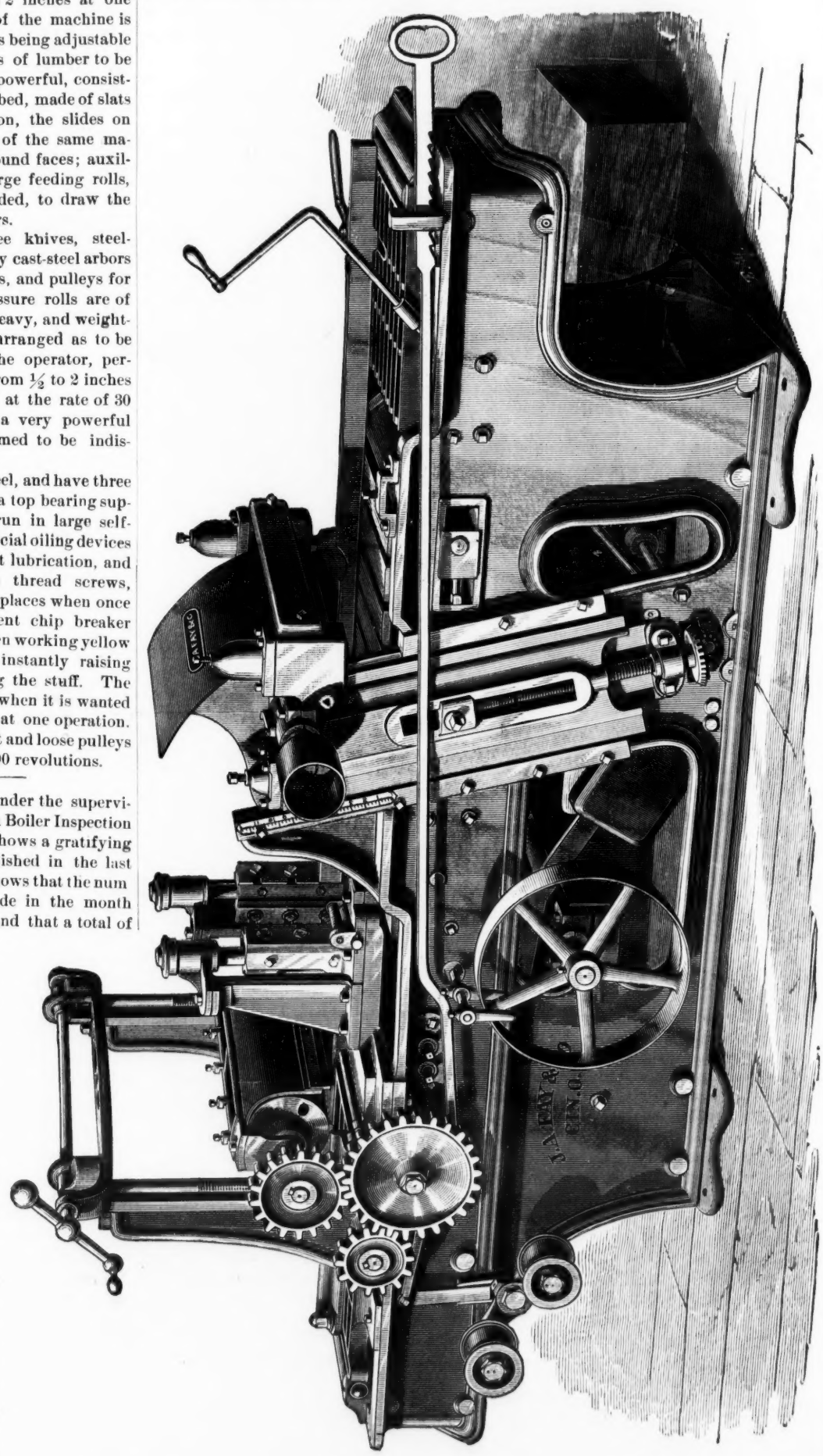
Large Car Sill Dressing Machine.

The large engraving on this page represents a car sill dressing machine to work three or four sides by J. A. Fay & Co., Cincinnati, Ohio.

This machine has been specially designed for the heaviest descriptions of work required in railway, car, and bridge building. It is made to surface and square up on three or four sides, 16 inches wide by 8, 10, or 12 inches thick, at one operation, and has the capacity to reduce car sills 2 inches at one cut if needed. The bed of the machine is fixed, the cylinder and rolls being adjustable to the various thicknesses of lumber to be planed. The feed is very powerful, consisting of a revolving endless bed, made of slats from the best cold blast iron, the slides on which they travel being of the same material, with accurately ground faces; auxiliary to this, a pair of large feeding rolls, expansively geared, are added, to draw the timber from the side cutters.

The cylinders have three knives, steel-lipped chip breakers, heavy cast-steel arbors running in self-oiling boxes, and pulleys for two belts. The upper pressure rolls are of wrought iron, made very heavy, and weighted with folding levers, so arranged as to be under instant control of the operator, permitting of sills varying from ½ to 2 inches in thickness to be finished at the rate of 30 feet per minute. This is a very powerful combination, and is claimed to be indispensable to sill dressing.

The side heads are of steel, and have three knives; the spindles have a top bearing support, are very heavy, and run in large self-oiling bearings, having special oiling devices for maintaining a constant lubrication, and adjusted by heavy square thread screws, which retain them in their places when once set. There is also a patent chip breaker which prevents tearing when working yellow pine sills; also a lever for instantly raising the front rolls for entering the stuff. The under cylinder is added when it is wanted to square up all four sides at one operation. The counter-shaft has tight and loose pulleys 18x10, and should make 900 revolutions.



The number of boilers under the supervision of the Hartford Steam Boiler Inspection and Insurance Company shows a gratifying increase. The report published in the last issue of their *Locomotive* shows that the number of inspection visits made in the month of June, 1880, was 1,691, and that a total of 3,463 inspections were made, of which 1,199 were annual complete internal and external inspections. The hydraulic test was employed in 229 cases. A large part of the boilers tested were new and in the yards of the makers.

The total number of defects brought to light during these 30 days was 1,525, of which a pretty large percentage (nearly 30), viz., 447, were considered dangerous. They were as follows:

Furnaces out of shape, 73—21 dangerous. Fractures, 170—113 dangerous. Burned plates, 65—19 dangerous. Blistered plates, 240—23 dangerous. Deposit of sediment 190—55 dangerous. Incrustation and scale, 317—66 dangerous. External corrosion, 117—40 dangerous. Internal corrosion, 54—24 dangerous. Internal grooving, 13—11 dangerous. Water gauges defective, 30—5 dangerous. Blow-outs defective, 16—4 dangerous. Safety valves overloaded and otherwise defective, 15—4 dangerous. Pressure gauges defective, 114—28 dangerous. Boilers without gauges, 60. Cases of deficiency of water, 13. Braces and stays broken, loose, and detached, 38—34 dangerous. Boilers condemned, 30.

A commercial traveler, of Worcester, Mass., has for several years traveled over New England upon a large bicycle, with which he is said to have averaged about forty miles a day. He carries two sample bags suspended beneath the seat, a set of tools and an oil cloth suit for stormy weather. He recently made a run of seventeen miles in an hour and fifteen minutes—over fourteen and a half miles an hour—and says he can successfully compete, in point of time, with runners who travel by rail.

Jesse Walrath, for a number of years superintendent of the Corliss Steam Engine Works, at Providence, R. I., has resigned his position and accepted a position with the firm of J. I. Case & Co., at Racine, Wis. We wish Mr. Walrath success in his new position.

The manufacturers of agricultural implements have doubled in the United States during the last ten years. In 1850 this industry gave employment to 5,361 hands. This year, according to census returns, it gives employment to 40,680. Ohio leads off, employing 10,248 people in this branch of manufacture; Illinois follows closely with 8,000; New York next with 7,237; and then Pennsylvania, employing a few over 3,000. The census enumerators have probably missed a great many that should be included in this summary. Twenty years ago all this class of manufacture was confined to New York and the New England States.

It is expected that the eastern end of the Northern Pacific Railroad will be completed to the Yellowstone by the advent of winter, and by the same time 458 miles will be completed on the Pacific side.

Some ingenious man in Rhode Island has discovered a use for the despised milk weed. Its seeds yield a finer oil than linseed; its gum is as good as India rubber, and its floss resembles Irish poplin when spun.

Letters from Practical Men.

A Railway of 23¾ Inches Gauge.

Editor American Machinist:

I have read with much interest Mr. F. H. Morse's short reference, in your issue of the 7th of August, to the 2-feet gauge railway running from Farmington to Phillips, Me.; the more so as I have under my charge, as engineer, one of the most striking examples in the world of narrow gauge roads, and though before my connection with the railway in question, I ever advocated such lines as the most economical means of developing the wealth of regions inaccessible to normal railroads, experience in working this, the North Wales Narrow Gauge Railway, confirms my views on almost every head.

The following description of this little railway and the region through which it runs will, I trust, prove interesting to the advocates of such lines, as well as to the railway interest at large:

These lines are of the unique gauge of 1 foot 11¼ inches; they traverse a district extremely popular with tourists in quest of mountain air and scenery; they likewise tap the traffic of some of the most extensive slate quarries in this part of the principality.

The main line forms a junction with the London and Northwestern Railway at Dinas Dinlle, of Roman fame, and distant from Carnarvon two miles. At this junction there are transhipment sidings for passengers, goods and minerals. From this point the railway winds to the left for a considerable distance, and then alternately to the right and left in curves, whose radii vary from 4 chains upwards, rising at the same time for a distance of 2¼ miles upon a gradient of 1 in 47. At this distance from Dinas occurs Tryfan Junction, whence the Bryngwyn branch, the heaviest portion of the work, diverges from the main line.

Hence the line follows for some distance the undulations of the ground, which permit of comparatively easy gradients and curves, but after Waenfour village and quarries are passed, and Quellyn Lake is neared, the jotting rocks of towering and precipitous mountains impose, once more, sharp and recurring curves of two chains radii. For some distance this section of the line is grafted, as it were, on to the rocks, and at places the formation rises abruptly from the bed of a rapid stream, the sparkling waters of which wash the retaining walls of the line.

These bold and striking features passed, the line wanders on alternately to the right and left, crossing the river repeatedly by means of iron bridges, and presently reaches the foot of the king of Welsh mountains, Snowdon.

Here the traveler comes upon a deep ravine and murmuring waterfalls, and charming glimpses of scenery break into view. This gap is spanned by an imposing iron bridge 100 feet in length. Near this spot, which is appropriately named Dingle, are footpaths and tracks by which the summit of Snowdon is reached, and one of the most glorious vistas of which England can boast rewards the climber for his toil. Next in order past this dingle is Rhydda village and quarry, and hence the line pursues the windings of the valley to Beddgelert—of ancient Gallic lore—always on the mountain side, and with recurring curves and gradients equalling in severity those already described.

The Bryngwyn branch, previously alluded to, doubles back on the main line by a curve forming a complete semi-circle, and having a radius of 3 chains, or 198 feet. The line wanders round the spurs of the hills up to the Alexandra and other extensive slate quarries. Of this branch one quarter of a mile rises 1 foot in 47; a half mile ascending at the rate of 1 in 40, and one and one-half miles at 1 in 30. On this last gradient are numerous reverse curves of radii ranging from 2 chains, or 132 feet, upwards, culminating in a complete horseshoe curve, having a radius of 4 chains.

On this section of the line scarcely any straight road occurs, the line being a series

of continually-recurring curves and reverse curves, and at the head of the horseshoe curve before mentioned occurs an inclined plane, having a rise of 1 in 10, which is worked by stationary engines and wire ropes.

The railway is laid with rails weighing 35 pounds per yard, and are secured to wooden sleepers by means of clip plates and forge bolts and spikes. The sleepers are of larch principally, 3 ft. 9 in. long, 7 in. wide and 4 in. deep; generally the ballast on the line is good.

The switches and signals are interlocked at the stations and junctions; turnpike and occupation roads are carried over the line as a rule on masonry bridges. The bridges crossing the various streams have wrought iron plate, main girders.

The rolling stock originally placed on the line consisted of 2 Fairlie engines, 2 double bogie carriages, 2 short 4-wheeled carriages, 10 coal trolleys, 5 timber trucks, 3 covered flour trucks. 90 slate trucks, and 10 ore wagons, each with four wheels.

The engines have cylinders 8½ in. diameter and 14-in. stroke, 6 coupled wheels 2 ft. 6 in. diameter under the leading bogie, the latter being the steam bogie. The trailing bogie, which is simply a carrier, has wheels 1 ft. 7 in. in diameter. The engines have side tanks, coal box at trailing end, weigh 14½ tons in working order, cost £1,800 each, and take a load of 30 tons over the steepest gradients on the line.

The bogie carriages have 1 first-class, 1 second, and 2 third-class compartments, also compartment for guard. They seat 28 passengers in all, weigh 5½ tons empty, and cost £360 each.

The small 4-wheeled carriages seat 16 third-class passengers, weigh 2⅛ tons empty, and cost £200 each.

The coal trolleys weigh 33 cwts., carry 3 tons and cost £72 each.

The timber trucks weigh 14¼ cwts., carry 30 cwts., and cost £70 each.

The flour trucks weigh 26½ cwts., carry 30 cwts., and cost £81 each.

The slate trucks weigh 13½ cwts., carry 30 cwts., and cost £22. 15/ each.

The ore trucks weigh 15¾ cwts., carry 30 cwts., and cost £28. 10/ each.

Of Cleminson's Flexible Wheelbase Rolling Stock there is one locomotive, two passenger carriages and four coal wagons; the carriages and wagons being on six wheels in each case.

The engine has cylinders 10 inches in diameter and 16-inch stroke; 6 coupled wheels 2'.6" diameter. The engine has a tank over the boiler, weighs 16 tons in working order, cost £1,050, and takes a load of 50 tons over the steepest gradients on the line.

The carriages are divided thus: one has first and second class compartments and a guard's compartment; the other two have all third class accommodation. The first-named seats 14 first and 18 second class passengers, and has a space for luggage in the guard's compartment; this vehicle weighs 4½ tons, is fitted with brake-gear and apparatus, and cost £210. The third class carriages seat 42 passengers, weigh 4¼ tons empty, and cost £180 each. The coal wagons weigh 2¾ tons empty, carry 8 tons, and cost £80 each.

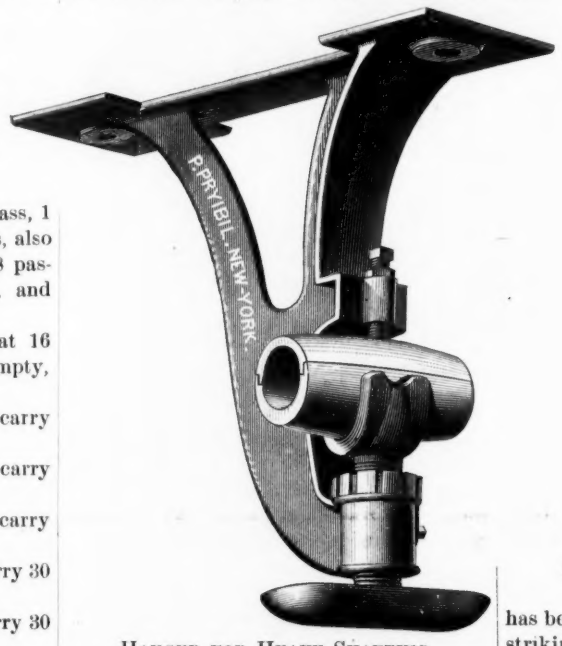
An analysis of figures of cost, shows most significantly the economy attendant on the use of the Cleminson system in engines, carriages and wagons alike, for we see that the Fairlie engine, whilst costing more than half as much again as the Cleminson engine, takes but three-fifths of the loads which the latter locomotive hauls over the same ground and under like conditions. In other words, the Fairlie engines take a load equal to twice their own weight—cost £60 per ton of load hauled. On the other hand, the Cleminson engine takes a load equal to three times its own weight—costs £24 per ton of load hauled. It is a simple engine, without any of the ball and socket joints and other complex parts inseparable from the Fairlie engine.

From experience in working it is found that the cost of the Fairlie engine, in repairs and maintenance charges, exceeds that of the Cleminson engine by 60 per cent., by reason of the greater number of moving and frictional parts. Owing to their cramped fire-boxes, they require a higher quality of coal, costing 18s. per ton, whilst the Cleminson engines use ordinary steam coal, costing 9s. per ton.

The passenger carriages in like manner exhibit striking results; for against the dead weight of 5½ tons, and seat capacity for 28 passengers of the composite bogie cars, we have in the Cleminson carriages a dead weight of 4½ tons to a seat accommodation of 32 passengers; that is to say, whilst the dead weight in the Cleminson vehicle is nearly 20 per cent. less, the seat capacity is nearly 17 per cent. greater.

By comparison of the third class carriages, we find also that whilst 16 passengers only are accommodated in the carriages on 4 wheels, weighing 2½ tons, 42 passengers are seated in the Cleminson carriages weighing 4½ tons.

Viewed by another standard, we perceive that the composite bogie carriages have a carrying capacity of only 5 passengers per ton of dead weight; the Cleminson carriages have a capacity of a fraction over 7 passengers per ton of dead weight. Regarded again from the point of cost, the bogie cars cost nearly £13 per seat, whilst the Cleminson carriages cost £6, 12/ per seat.



HANGER FOR HEAVY SHAFTING.

Applying the same test to the four-wheeled third class carriages, we find in those vehicles a capacity of rather more than 6 passengers per ton, whilst in the Cleminson third class carriages the capacity equals 10 seats per ton of dead weight. In point of cost, the former shows £12. 10/ per passenger against £4. 6/ per passenger in the latter.

Taking the wagon stock again, we discover that the original wagons have a dead weight equal to 55 per cent. of their load capacity, whilst the Cleminson wagons have a dead weight of 35 per cent. of load capacity. In other words, the former carry a load of barely double their weight, whilst the Cleminson wagons have a load capacity of nearly three times their weight.

The cost of the respective wagons exhibit remarkable economy in the Cleminson wagons: for instance, the original wagons cost over £2 per cwt. of their weight, and £1.5.0 per cwt. of capacity, whilst the Cleminson wagons cost barely £1.10.0 per cwt. of weight, and 10 s. per cwt. of capacity.

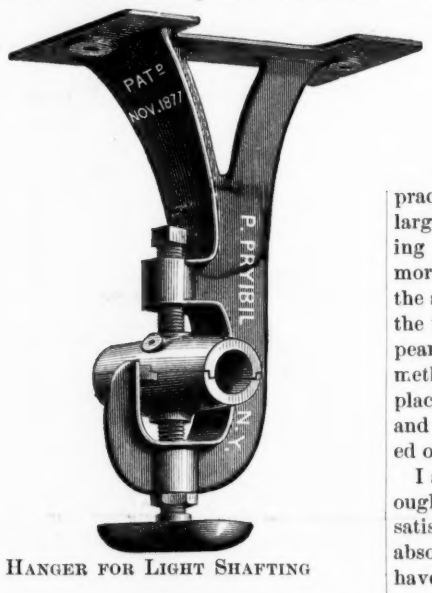
Facts, such as these, need no comment, for practical minds grasp at once their import and bearing on the first cost and maintenance of railways.

The arrangements for the transhipment of coal are so complete that the contents of a L. & N. W. wagon are merely tipped by means of a tipping table into a narrow gauge track, and the work of transhipment proceeds as fast as the wagons can be marshalled.

The speed, as a rule, on this section of the L. & N. W. Railway, is from 30 to 40 miles an hour; on the narrow gauge a speed of 30 miles an hour is often attained, but the ruling speed is 15 miles.

When it is considered that so diminative a line works side by side with the leviathan L. & N. W. Railway, and deals with the same traffic, and loads as its great neighbor, it may, with good reason, be claimed that Narrow Gauge Light Railways have more to recommend them than is generally conceded, especially where the Cleminson system of engines and rolling stock is employed.

This unique instance of Narrow Gauge Railways was wont to be considered one of the best evidences of what such railways, when worked by means of the Cleminson system of rolling stock, are capable of, but even this has been surpassed by the Darjeeling Steam Tramway in India. This last named line, which is also 2 feet gauge, has curves of 50 feet radius, and a continuous rising grade of 1 in 30, for a distance of 35 miles, with short stretches thereon of 1 in 25 or 4 per cent. This line is also worked by rolling stock on the Cleminson system, so far as official reports show, during the short time it has been in operation, with economy equally striking with that prevailing on the North Wales Narrow Gauge Railway.



HANGER FOR LIGHT SHAFTING

I shall be happy to afford you or your readers, or any one else, interested in such matters, any further evidence touching this very interesting subject.

Yours very truly,
JAMES CLEMINSON.

North Wales Narrow Gauge Railways: Engineers' office, 5 Westminster Chambers; Victoria Street, London, England.

UNIFORMITY IN DRAWINGS.

Editor American Machinist:

On page 3, of your issue of Sept. 11, I was glad to see an answer to my letter, which appeared in No. 28. This answer, in itself, shows the necessity of discussing the point in question, as there is evidently a diversity of opinion on the subject.

Your correspondent says that my article is calculated to confuse many machinists and drawing readers, because *contrary to common sense and best practice, in his opinion*; and then goes on to say that, "after viewing side *a*, in Fig. 1, the *natural method* of seeing side *b*, is to roll it toward the right, 90°, as in Fig. 2, &c." It may be common sense to roll over a ⅛" or even a 3" nut, in order to view the different sides, but I am a little skeptical as to the ability of your correspondent to roll over a condenser or cylinder casting weighing a few thousand pounds. It seems to me more like common sense to walk around the object. The matter of placing the projection on paper depends upon descriptive geometry, and is conventional in so far only, as the choice of one of the four angles made by the planes of projection is concerned.

The projections your correspondent uses are correct, and, theoretically considered, are due to placing the object in the first angle. Either method requires the use of the imagination as far as placing the eye at an infinite distance from the object is concerned, and, furthermore, in the one case the paper is seen through the object, and in the other the the object is seen through the paper. As to the common sense in the matter, there is a greater possibility of seeing a wrought iron nut through paper (provided you use tracing paper), than of seeing any kind of paper through a wrought iron nut.

Your correspondent seems to ignore that mechanical drawing is based on any theory, by saying, "there can be no positive rule regarding which view is to be shown first, or whether it is revolved to the right or left, or forward or backward." In answer to the above quotation I reiterate, that there can and should be a positive rule with regard to the relative position of projections, and the sooner it is settled upon the better, for reasons which I gave in my last letter. Theory and practice should be combined harmoniously. The two methods spoken of are directly opposed to each other, both theoretically and practically, and a person used to reading drawings made according to the one will misinterpret drawings made according to the other.

The question as to the best practice must be decided by the custom of the best and most systematic engineering firms in the country. I am aware that Messrs. Wm. Sellers & Co., I. P. Morris & Co., Wilson Bros., and others, adopt the method I advocated in my letter. This method is from a practical point of view applicable to both large and small objects, there being no rolling necessary. Besides, I believe it to be more natural and less confusing, to look for the side elevation of an object on that side of the front elevation on which the former appears as an outline of the latter. Using the method your correspondent advocates, would place the side elevation on the opposite side, and would lead to such a mistake as I pointed out in the drawing of the slide valve.

I shall be pleased to see this subject thoroughly ventilated and settled upon to general satisfaction, as uniformity in this respect is absolutely requisite to avoid losses such as I have spoken of.

Yours truly,
ARTHUR FALKENAU.

Leadville, Colo., Sept. 21st, 1880.

DEFINITIONS.

Editor American Machinist:

The most heated debates have grown up under the shelter of looseness in definitions. It has been supposed, however, that the elementary terms of physical science were as well settled, as to their significance and proper use, as things human can be.

It is a little surprising, then, to see Mr. Nystrom's article in the AMERICAN MACHINIST, of Oct. 2nd, open with the unqualified statement that "Force is a tendency to stop motion."

In the first place, force is not "a tendency" of any kind. It is true that force *tends*, sometimes, to stop motion. Force *has* such a tendency, sometimes; the tendency is an attribute or quality of the force, but is not the force itself. Hardness is an attribute of steel, but hardness is not steel.

But if force is defined as that which tends to stop motion, by what name shall we call that which tends to *produce* motion? Mr. Nystrom's definition of force does not include it; it must, therefore, have some other name, if any.

It is also surprising to read that the definition of force "generally used" is "a tendency to produce motion."

The substance of the definition accepted by the standard writers of the present day has been variously expressed, but amounts to this: "Force is that which tends to produce, prevent, change or destroy motion." And it will be long before any which differs substantially from this will be "generally used."

And now our esteemed friend of the "Apprentice Papers" takes a seat in the same boat, and says, on the same page: "In referring to the size of bodies, science uses the term *mass*, which means the same as bulk."

Science uses the term "mass" with reference, not to bulk at all, but to the absolute *quantity of matter* in a body. The masses of different bodies, at the same place are as their weights, since, in the same latitude, gravity acts with equal force on equal quantities of matter. Identical masses weigh more at the poles than at the equator. The weight of any body, divided by the force of gravity at the latitude in which it is weighed, is a measure of its mass.

Once more. In the closing paragraph of the same article we read: "The closer together the atoms of matter are packed, the greater the cohesion."

Packing the atoms together results in *density*, not necessarily in cohesion. The atoms of lead are very closely packed; its density is great, its cohesion comparatively little.

The atoms of copper are less closely packed, it has considerably less density, but greater cohesion than lead; and wrought iron has still less density, but greater cohesion than copper. The two qualities are distinct and independent.

To use language so as to convey truth clearly and simply is an object worthy of the most scrupulous care.

A. B. Couch.

Philadelphia, Pa.

Adjustable Hangers for Shafting.

We illustrate on the opposite page a convenient style of hangers for shafting.

The advantages of these hangers are that they may be adjusted vertically by means of set screws, and having pivoted bearings, accommodate themselves to the position of the shaft, which insures an equal bearing the length of the box. The boxes have wipers at each end, which exclude the dust and dirt, as well as preventing the escape of the oil. An oil cellar is located within the casting which forms the box, and a woolen feeder reaching the length of the bearing supplies the oil required for lubrication. Another advantage of these hangers is, the shaft may be removed without disturbing the hangers.

These hangers are made to suit any size of shafting, and, when preferred, are furnished with double castings and the box located in the centre, which is preferable for very heavy shafting—the means of adjustment being the same as shown by the illustrations. These hangers are made by P. Prybil, corner of West 40th street and Tenth avenue, New York.

The *Age of Steel* says: A Hartford gentleman has nearly completed a carriage for use on ordinary roads to be propelled solely by compressed air. The shafts, of course, are omitted, but otherwise the carriage will resemble in the main those commonly used. The machinery, in very compact form, is under the rear axle, and the air will be taken into it from a reservoir in sufficient quantity to furnish motive power for a run of many miles.

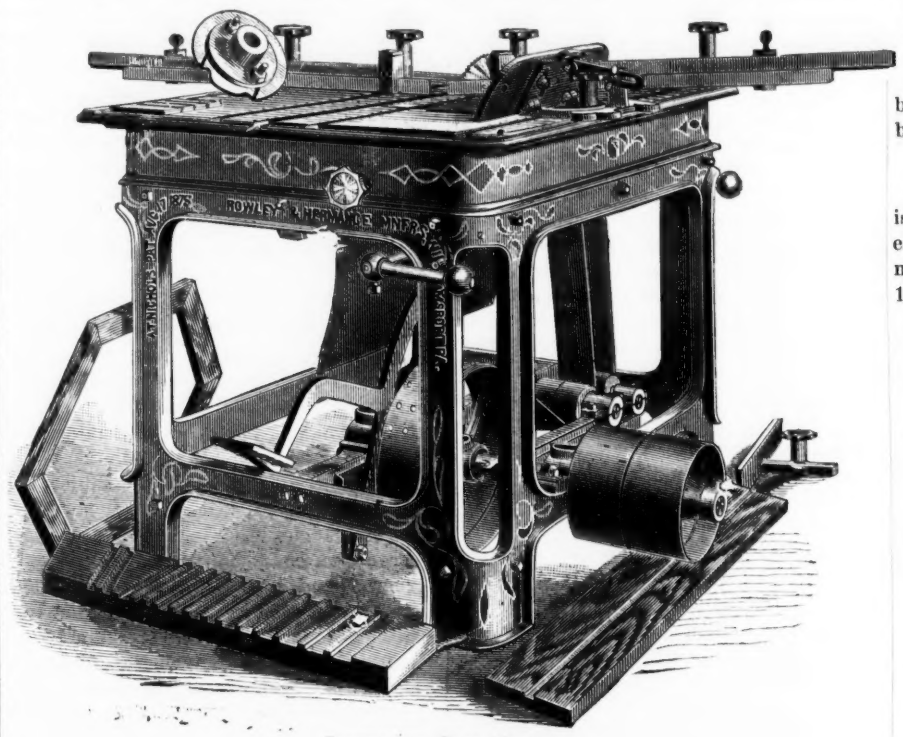
Wonder if the Hartford gentleman got his idea from our editorial entitled "Every Man His Own Locomotive," which appeared in the American Machinist of February 7, 1880?—though now that the matter comes up, we believe we did forget to take out a patent on the idea!

Improved Saw Bench and Blind-Making Machines.

The first engraving on this page represents a combination cutting-off saw, rip saw, miter sawing, bevel sawing, and dadoing machine, made by Rowley & Hermance, Williamsport, Pa. It is well adapted to making window frames, mitering heavy mouldings, plowing and grooving window sills, furniture work, etc. The driving belt is self-straining. It is not complicated; can be changed from one use to another in one minute.

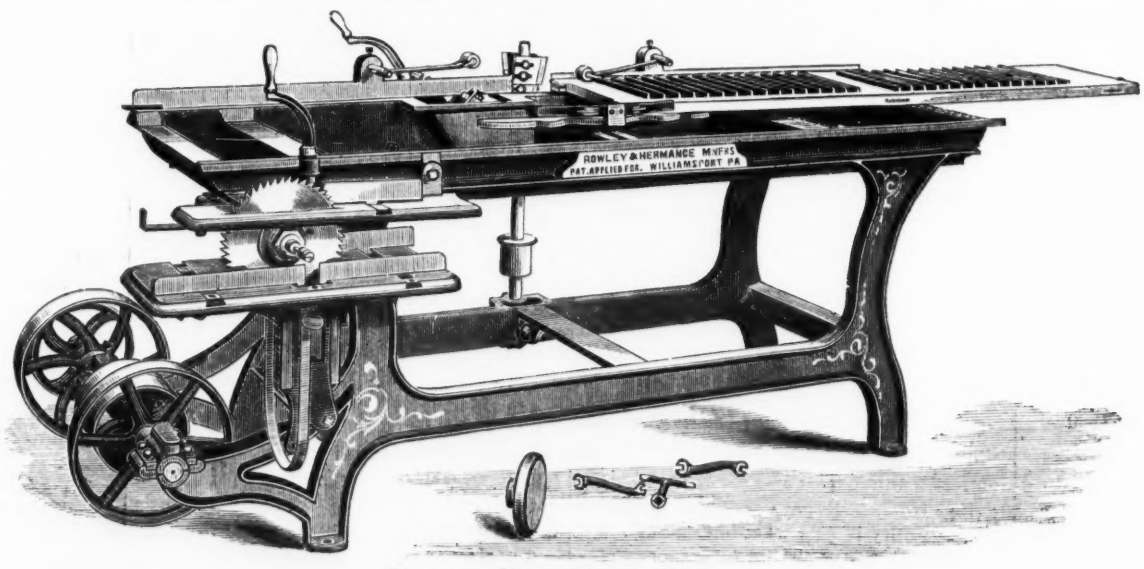
The saw mandrel is placed on a carriage (under which are rollers to lessen the friction), and travels on ways. The saw is drawn toward the operator by the foot treadle, which allows the operator the use of both hands to handle the stuff, by which arrangement he can accomplish more work than with the usual styles of cutting-off saw bench. The mandrel is raised and lowered, by means of rack and pinion, to adjust the saw and dado head to different thicknesses of work.

The engraving on the lower part of the page shows a blind-jointing, rabbeting and beading machine made by the same firm.



Improved Saw Bench.

This machine is designed for jointing, rabbeting and beading blinds of any width in one motion. It is simple, quick and efficient, and can be operated by a boy. The head on upright arbor rabbets and joints, and is constructed so as to give the knives a draw cut, which leaves the work smooth. The head on horizontal arbor beads the stile, and is adjustable for different thicknesses of work. The spring that holds the blind up to the gauge is fastened on outer bed rest, and is quickly adjusted for different widths. The blind is fed by hand and is finished in once passing through. The guides are in two parts; the one in front of the cutter head can be adjusted to take a heavy or light cut; the guide in rear of cutter head is always set forward the depth of the cut, by which means the blind is jointed perfectly straight.



Improved Blind Making Machine.

B. F. Larned has begun work on a new satinet mill, 121×42 feet, and three stories high, at Auburn, Mass.

New Zealand Railways.—The railway returns of the colony, New Zealand, for the financial year show that the working expenses have absorbed 74¾ per cent. of the gross earnings. Important reductions are being made in the working expenses, salaries being cut down 12½ per cent., and the staff reduced in number.

How to Measure a Coil of Belting.—Add the diameter of the hole, in inches, to the outside diameter of the roll; multiply by the number of coils in the roll; then multiply this by the decimal .1309, and the product will be the number of feet in the roll. To have the exact length, the average diameter must be used if the roll is not perfectly round, and fractional parts of an inch must not be omitted in the calculation.

It is said that a manufacturer, whose business requires the use of large amounts of emery, has been trying an experiment with the ashes of anthracite coal, and he affirms that he has got good results from ashes as a substitute for the finer grades of emery. He took ashes and saturated them with water, pouring off the liquid after standing an hour or two, then pouring off again, and so on until he obtained several grades, down to a substitute for emery flour. When dried the deposit cuts readily, and leaves a satisfactory surface.

The brig John Laughlin, with a dozen Baldwin locomotives for the Government of South Australia, will leave Philadelphia in a few days for Adelaide, and the brig Annie Reed, with nine turn-tables manufactured by Wm. Sellers & Co., lately started from New York for the same destination.

Utilizing Steel Scale.

Two English engineers, Porter & Thomas, have established works at Bowesfield, England, for the manufacture of paint from steel scale, for the protection of iron and steel in any position and in any climate. They obtain from steel works in their neighborhood the scale that falls from the steel as it passes through the rolls, which would be otherwise mainly wasted, and can be utilized at small cost. This scale is ground as fine as flour and as free from grit, and is then mixed with boiled oil and coloring matter. Two kinds are manufactured, an anti-corrosive paint, to prevent structures in the air from rusting, and an anti-fouling paint for use under water. Very flattering reports of the success of this product, as applied to bridges, buildings, railway stock, shops, boilers, blast furnaces, etc., are published.

The following figures taken from the British Board of Trade returns, are those of exports to the United States of the articles named for the months of July, 1880, August, 1880 and July, 1879:

Articles.		Month of July, 1880.	Month of August, 1880.	Month of August, 1879.
Hardware and Cutlery	£	45,415	44,624	31,808
Iron:				
Pig	tons	27,194	27,193	12,112
Bar, angle, rod, &c.	"	1,524	1,909	816
Railroad, all	"	14,845	16,311	4,719
Hoops, sheets, plates, &c	"	3,610	1,057	374
Tinplates	"	11,186	16,300	14,707
Cast or wrought	"	1,968	5,788	2,000
Old	"	2,596	4,181	19,043
Steel, unwrought	"	1,183	908	459
Lead, unwrought	"	10	—	175
Steam-engines	£	252	170	127
Other machinery, &c.	£	35,596	5,794	15,882
Tin, unwrought	cwts.	212	—	—
Special Returns—				
Iron rails	tons	7,785	4,419	—
Steel rails	"	7,154	4,584	—

In Mr. Nystrom's article on Thermo-dynamics in our issue of October 2d, an error occurred in the thirteenth paragraph, where it reads "52 foot pounds of work" it should read 14,400 foot pounds of work.

Manufacturing Notes.

Many of the cotton and woolen mills of New England have had to stop work temporarily on account of low water. Several of them have ordered steam engines.

In the town of Mexico, Missouri, the woolen mills, in the early part of last month, were kept busy running, with double sets of hands, day and night.

John Williams & Sons, manufacturers of cotton and woolen goods and dress-goods novelties, are building a large brick factory at Carpenter and Twelfth streets, Philadelphia, to give employment to 150 hands.

Work has begun at West Warren, Mass., on a new mill for the Warren Cotton Company.

Munn & Baush, Holyoke, Mass., will erect a machine shop near their foundry.

The Delamater Iron Works of this city have recently shipped a new air compressor to the Calumet & Hecla Mine Company, Lake Superior. The compressor has two cylinders 32x48 in., and is to be driven by being geared to an engine. It is said to be the largest compressor ever built in this country.

A company is forming to succeed Ely, Balch & Co., hoe and fork manufacturers, St. Johnsbury, Vt.

AMERICAN MACHINIST

PUBLISHED WEEKLY

BY

American Machinist Publishing Co.

Horace B. Miller, Prest.

Jackson Bailey, Vice-Prest.

Lycurgus B. Moore, Treas. and Sec.

96 Fulton Street, New York.

Jackson Bailey, Editor. Horace B. Miller, Business Manager.

Lewis F. Lyne, Mechanical Engineer.

The American News Company,

Publishers' Agents, New York.

The International News Company,

(Formerly the Wilmer & Rogers News Co.)

11 Bouverie Street, (Fleet St.) London, Eng.

Will receive subscriptions for the American Machinist at 17 shillings per annum, postage prepaid.

DEALERS SUPPLIED BY

The New York News Company, New York.
The National News Company, New York.
The New England News Company, Boston, Mass.
The Central News Company, Philadelphia, Pa.
The Western News Company, Chicago, Ill.
The St. Louis Book and News Co., St. Louis, Mo.
The Cincinnati News Company, Cincinnati, Ohio.
The Detroit News Company, Detroit, Mich.
The Pittsburgh Book and News Co., Pittsburgh, Pa.
The Baltimore News Company, Baltimore, Md.
The Rhode Island News Co., Providence, R. I.
The San Francisco News Co., San Francisco, Cal.
The Brooklyn News Company, Brooklyn, L. I.
The Newark News Company, Newark, N. J.
The Northern News Company, Troy, N. Y.
The Albany News Company, Albany, N. Y.
The Washington News Co., Washington, D. C.
The Toronto News Co., Toronto, Ontario, Canada.
The Toronto News Co., Clifton Branch, Clifton, Ontario, Canada.

SUBSCRIPTION.

$3.00 a year, in advance, postage prepaid in the United States and Canada.
$4.00 to Foreign Countries, postage prepaid.

ADVERTISING.

Transient, 30c. per line, (12 lines one inch.)
"Business Specials," 40c. a line.

EDITORIAL ANNOUNCEMENTS.

☞ *Positively we will neither publish anything in our reading columns for pay or in consideration of advertising patronage. Those who wish to recommend their wares to our readers can do so as fully as they choose in our advertising columns, but our editorial opinions are not for sale. We give no premiums to secure either subscribers or advertisers.*

☞ *Every correspondent, in order to insure attention, should give his full name and address, not for publication, but as a guarantee of good faith.*

☞ *We are not engaged in procuring patent rights, or in selling machinery; nor have we any pet scheme to advance, or hobby to ride.*

☞ *We invite correspondence from practical machinists, engineers, inventors, draughtsmen, and all those specially interested in the occupations we represent, on subjects pertaining to machinery.*

☞ *Subscribers can have the mailing address of their paper changed as often as they desire. Send both old and new addresses.*

☞ *Subscribers who fail to receive their paper promptly will please notify us at once.*

☞ **Entered at the Post Office at New York, N. Y., as second class mail matter.**

NEW YORK, OCTOBER 16, 1880.

CONTENTS.

PAGE.

Hydraulic Forging at Edge Moor. By Robert Grimshaw, Ph. D. 1
Dry Plumbago vs. Tallow and Oils in Steam Cylinders. By William J. Williams 2
Plumbago as a Lubricator. By Wm. J. Williams. 2
Westcott's New Lathe Chuck 3
New Incorporated Massachusetts Companies 3
Apprentice Papers. By Chordal 4
Shop Kinks, No. 1. By L. F. Lyne, M.E. 4
Iron and Steel Excursion Steamboats 4
Large Car Sill Dressing Machine 5
Letters from Practical Men 5
Adjustable Hangers for Shafting 7
Improved Saw Bench and Blind Making Machine. 7
Prospects for Working Mechanics 8
Emigration of Mechanics 8
Literary Notes 8
Questions and Answers 9
Manufactures 9
Machinists' and Engineers' Supplies 10
Iron Review 10
Metal Review 10

Prospects for Working Mechanics.

The working mechanics of America have cause for great rejoicing, after striving against severely adverse circumstances for about six years, that the conditions of business have changed so strongly in their favor. Not only are wages higher in proportion to the cost of living, and the demand for good mechanics active, but, according to present prospects, this happy state of affairs is likely to continue, at least for many months to come. During the past summer season it has been noticed that mechanics have generally availed themselves of their increased financial means to enjoy more pic-nics, excursions and days for varied recreations than in any other summer since the panic. It is gratifying to see this evidence of prosperity. They are enabled to secure more home comforts, and at the same time save a little money as a nucleus for an independent business in the future. Just here we wish to offer a bit of advice. With most mechanics, beginning to save money is a very difficult step to take; unless, however, something is accumulated for a moderate investment in business, the chances are very much against a mechanic's getting started on his own account. With most men, so situated, it is a puzzling problem to decide what is best to be done with money saved. Savings banks, as a rule, should be regarded with suspicion. If their business flourishes depositors will probably get their dues (if the bank officials are honest), but if it is adverse, depositors, and not the bank managers, will be the losers. It is unwise for mechanics to invest their whole savings in anything that will not yield back the money, *fully and without question*, upon short notice. It may be desirable sometimes to buy real estate and to pay for the same by installments, but there are serious objections to this plan. Not only is all the money paid before the final installment locked up where it is unavailable in case of emergency, but should difficulties arise, making it impossible to meet payments when due, a large proportion of it is likely to be sacrificed. Any mechanic who is anxious to accumulate means to begin an independent business should keep clear of debt, though great inducements are offered to get into that inexorable bondage. No better way to take care of money saved has yet been offered than that suggested by Chordal, in these columns, some months ago. "Every pay-day go to the post-office and get a money order for your extra cash. Don't try to make the figure even, but for any amount, seven, nine, eleven or seventeen dollars—anything you can; don't dare to make the order larger. Get the money order on pay-day, sure. Have the order made payable to the Treasurer of the United States, and take it home. This is safe; no one can get any good out of these orders if they are stolen; if burnt up or lost you can get duplicates. Do this every pay-day; never miss a single one under any circumstances, and when you get a hundred dollars worth take them to any bank, or to the man you work for, and buy a hundred dollar government bond. Have that bond registered by all means." These money orders best be kept no longer than one year, as after that time their collection might be attended with some inconvenience. The smallest denomination of government bond is for fifty dollars. A holder of a United States bond can convert it into money any time desired, and it draws interest within one or two per cent. of what savings banks will pay. Its perfect safety and reliability is just what mechanics want when they invest their careful savings.

When a mechanic has once begun to set apart any portion of his earnings according to the above plan, he will find it to be less difficult to accumulate something than he had before supposed it to be. Now, while business and wages are both good is the time to begin saving, and those who are to own and manage the shops and mills of the country, ten and twenty years from this time, will surely begin as soon as they possibly can.

In the midst of a prosperous business for the cotton mills, the Fall River manufacturers have given notice to their operatives of another reduction of 10 per cent. in their wages. The position of the Fall River operatives is a peculiar one. They furnish not only the labor and skill to run the mills, but also a large portion of the capital, while the profits are absorbed by those who control the mills and bank corporations. The operatives as a class are thrifty. They deposit their surplus funds in the Savings banks, which in turn furnish the financial support to the mills. The bank directors and mill directors being, for the most part, the same individuals, they obtain both labor and capital from the operatives, as before stated. When business continues good, and the periodical defalcations are moderate, the operatives may get a good portion of their money back. They may go on a strike, but it will do them very little good, even if they gain their object. The most sensible course for these operatives, is to unite their savings, and start a co-operative cotton mill. They would then be their own masters and obtain the profits of their industry.

Emigration of Mechanics.

We are always glad to impart to our friends such information as we have, and naturally the newspaper sanctum becomes a focus for a good deal of substantial information upon many subjects of value to our readers. Prominent among the letters of inquiry sent us by workmen, apprentices and others, are letters asking our views on the subject of their emigrating to the east, west, north or south in this country, or to South America or other foreign countries. Some months ago our correspondent Chordal touched upon this topic somewhat in detail, arguing that the man who cannot do moderately well at home is not likely to do well anywhere. The man who does well at home may do better away from home, but simply doing well in the east does not necessarily make a man "a lieu tenant general in the west." It is impossible within the compass of a single article to touch upon the combination of circumstances and qualities which command success either at home or abroad, but the machinist who asks us whether he would be likely to do well in Indiana or Brazil, must put an adviser in possession of all these facts, before good advice can be given. Just now, the political machinist is probably the busiest machinist in Indiana. The eastern mehanic who settles in the west must make up his mind to become a western man with eastern proclivities, or he cannot succeed. The eastern mechanic who settles in the west, and remains still an eastern man cannot possibly succeed. Even in Brazil, the New England mechanic would probably do well to become a Brazilian with New England proclivities. If he attempts to introduce into Brazil the latest mechanical wrinkles that prevail in the best American shops, he will probably soon find reason to wish that he had remained a New Englander with Brazilian proclivities.

If, with a knowledge of mechanics, a kit of tools, a little money, and a great deal of courage and backbone, a New Englander should invade Dom Pedro's country, and undertake to set up business in any mechanical pursuit, results would follow without question, but just *what* results would follow, nobody can predict so well as the New Englander who has packed his kit, taken ship for Rio, and spied out the land for himself, while holding fast to his cash, until well satisfied that a venture would be a safe one. But he must first settle the difficult problem of adapting himself to circumstances, while retaining a staunch and progressive individuality.

It is nothing of an extraordinary character to hear of a strike of 5,000 or 10,000 operatives in a single trade in England. Not long ago 30,000 nail makers went on a strike at once. No intelligent individual need be told that there is something woefully wrong in the social, industrial or govermental system under which such labor upheavals become events of almost common occurrence. English workmen are instructed that they must accept a very low rate of wages, in order to produce goods cheaply to compete with the even cheaper labor of Germany and Belgium in the markets of the world. But American competition, which is becoming quite troublesome to them, can not be explained on the low wages theory.

One of our systems which is essentially different from theirs is that of a protective tariff as opposed to English free trade. One well-known British society, which, so far as we can learn, has never exercised itself to distribute industrial tracts among the workmen of their own country, is now engaged in spreading that kind of literature among the producing classes of the United States, with the object of convincing them of the beauties of free trade and the evils of our tariff. If these two opposing systems are to be judged by their results in the two countries which have adopted them, in the most radical degree, it would seem to require but little time for a well-informed citizen to decide which to favor.

Our edition of the December, 1878, issue of the American Machinist, has been exhausted, and we have received so many calls for the article published in that issue, entitled "Dry Plumbago versus Tallow and Oils in Steam Cylinders, by Wm. J. Williams," that we have decided to reprint this valuable article in this issue. Mr. Williams having contributed another article on "Plumbago as a Lubricator," we publish the two in the same issue, for the greater convenience of those who desire the more complete handling of this subject in small space.

The Treasurer of the American Society of Mechanical Engineers has handed us the following letter, received from Mr. A. L. Holley, which explains itself:

Tunbridge Wells, England, Sept. 17, '80.

L. B. Moore, Esq.,

Dear Sir:—I have received the catalogue of the Mechanical Engineers, and I congratulate you on its excellent appearance, and on the large membership. The circulation of the pamphlet will fill our ranks.

I am recovering from my desperate illness so rapidly that I shall sail for home Oct. 9th, and shall attend to my duties to the Society. I shall also read a paper at the meeting, Nov. 4.

Yours very truly,

A. L. Holley.

Literary Notes.

TRAUTWINE'S CIVIL ENGINEER'S POCKET-BOOK, of mensuration, trigonometry, surveying, hydraulics, hydrostatics, instruments, and their adjustments, strength of materials, masonry, principles of wooden and iron roof and bridge trusses, stone bridges and culverts, railroads, turnouts, turning platforms, water stations, cost of earthwork and foundation walls. In addition to which, the elucidation of certain important principles of construction is made in a more simple manner than heretofore. By John C. Trautwine, C.E. Illustrated with 670 engravings from original designs. Fourteenth thousand, revised and corrected. 16mo., 678 pages. Price, $5.00. Published by E. Claxton & Co., Philadelphia, Pa.

To the engineer who has heretofore possessed a copy of Trautwine's Engineer's Pocket-Book, it is unnecessary to attempt to say anything in explanation of, or complimentary to, the book; for, during the time since it first appeared before the engineering community, it has, undoubtedly, proved itself to be well adapted to the practice of engineers. As a work of reference, it has attained an eminence and appreciation which falls to the lot of few publications. In the new edition the most valuable matter has been collected and classified in a manner which is readily available. Many of the illustrations that were used in former editions have been replaced by those better illustrating the present practice of engineers. The instruments and devices mentioned are the latest improved. This book was originally intended for civil engineers only, but as it has been entirely rewritten and enlarged, the new attractions added will insure for it the approval of those engaged in mechanics generally. To give a proper review of the contents of the book, it would be necessary to rewrite it; but we may mention, as some of the leading features of interest, the following, viz.: On floatation, moments of

rupture and resistance, Kutter's formula, open and closed beams, the shearing of beams, and testing of beams. The valuable experiments of C. Shaler Smith, on eye bars and pins, are published for the first time, together with many new tables which are indispensible to engineers and machinists. This book has already been fully indorsed by the leading engineers of the country. We quote the following language of one of them, in expressing our opinion that "Mr. Trautwine's Engineer's Pocket-Book is a work that should be the corner stone of every engineer's library."

The intelligent individual who wishes to keep posted upon what is going on in the world of periodical literature, and has the disposition, time or means needed to enable him to wade through the vast mass of types that environs the really valuable matter which he wishes to read, cannot do better than to subscribe for the *Monthly Index to Current Periodical Literature, Proceedings of Learned Societies and Government Publications*, published at the office of the American Bookseller, 10 Spruce street, New York. This Index aims to select and classify the most valuable of such articles every month, (excluding fiction) specifying the name and date of the publication in which each appears in a convenient form for ordering. Its scope includes all departments of science and mechanics, religious, philosophical, financial, literary, legal, medical, geographical, and generally solid topics. The *Monthly Index* is to all this mass of substantial information what a catalogue is to a library, or a directory to a town, and should be in the hands of every thoughtful American. Subscription price, $1 00 a year; single numbers, 10 cents.

The Indicator, is the name of a new "illustrated journal of mechanical engineering and applied science," recently started by the well-known and able engineer, Wm. M. Barr, at Indianapolis, Ind. The number before us is No. 1 of Volume I, and is well calculated to be of use to intelligent and progressive students of mechanics everywhere. It will enlarge the circle of reading mechanics, and will add an additional impetus to the onward movement of mechanical progress in this country. We commend the new venture heartily to public notice. Subscription price, $1.00 per annum; single copies, 10 cents.

The *Telephonic Exchange Reporter*, for September, published by James W. See, Cincinnati, O., contains a full and interesting report of the National Telephonic Convention, recently held at Niagara Falls, N. Y., and other matters of interest to the profession.

Questions and Answers.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly and according to common sense methods.

(1) G. A., Cambridgeport, Mass., asks: Will you please solve the following problem: If a pinion 41-100 of an inch in diameter contains 18 teeth, what will be the diameter of a wheel containing 101 teeth? An answer to this will settle a dispute between a friend and myself. *A.*—The question is one of simple proportion and may be demonstrated as follows: As the number of teeth in the pinion, 18, is to the number of teeth in the wheel, 101, so is the diameter of the pinion .41 to the diameter of the wheel required—which is 2.30 in. It may be expressed thus:

18 : 101 :: .41 : (—) or 2.30.

(2) J. H. F., Catasauqua, Penn., writes: There are a great many plates of machinery in your paper which I want to preserve in a book for future reference. Cutting them out destroys much valuable reading matter in your paper, particularly "Chordal." Is there not a way of copying them easily and neatly? I recollect a party some years ago wanting to sell a process, but, what it was and whether it was of any use, I do not know. If you know of any way please inform me. *A.*—The most satisfactory way of duplicating pictures of any kind is by photography. In the present age of invention and improvement a sufficient knowledge of this science may be obtained by a little study and practice to enable a person to take a very fair picture. The dry plate process is very simple and is much used by amateurs, particularly. The plates may be procured from most dealers in photograhers' supplies with full particulars how to proceed. Copies of any picture may be readily obtained which may be finished in any desirable shape and at most any cost. We can usually supply extra numbers of the American Machinist of almost any date published.

(3) C. A. M., Camden, N. J., asks: Would you please let me know, through the answers to correspondents, which is the best method and most in use of short hand, also about how long it would take to learn it? Would you have to have a teacher and what books would I need? *A.*—There are a number of good systems of phonograpy which are taught in different ways. On account of the difficulty of obtaining teachers in some localities a plan has been adopted by some teachers of instructing through the mail. Some persons in the cities prefer this method as they can preserve the written lessons with the corrections by the teacher for future reference. The book used is Munson's Phonography which insures good, plain, intelligible writing.

(4) E. L., San Francisco, Cal., asks: 1. Will you please tell me how to set the eccentric of a cut-off valve that works on the back of a three-ported plain slide valve? The cut-off can be changed at will by means of a right and left hand screw thread as is usually practiced. What I wish to know is the position of the eccentric for operating the cut-off in relation to the crank-pin, and the eccentric which operates main valve when at the end of the stroke. I wish this to apply to inside and outside cut-off valves when connected direct to the valve stem, also when connected by a rocker shaft to the valve stem. *A.*—The usual practice for setting an eccentric for operating an independent cut-off, upon the back of a slide valve, and adjusted by a right and left hand screw, is for a direct connection to place the throw of the eccentric directly opposite the crank, while for a rock arm connection the eccentric should be placed in the same position as the crank. Some engineers claim that it is better to place the eccentric a little behind the position alluded to, but it appears to be more of a notion than anything else, as the cut-off can be adjusted by the screw so as to cut off at any part of the stroke. 2. Please tell me how to get the length of eccentric rod. *A.*—Roll the shaft so that the throw of the eccentric is directly above or below the center—above is the most convenient. Place the valve at the central position of its travel. The eccentric rod must be of such a length as to admit of connection without moving the valve. These directions apply to either a direct connection or where a rock arm is used. After the rod is adjusted, the shaft should be turned around a few times and the valve tested to ascertain if it is exactly square, as a variation is generally caused by lost motion in the bearings.

(5) R. A. McB., Holyoke, Mass., writes: Could a young man, a good machine forger, do well in South America and in what part could he do best? I have been to Pernambuco, Brazil, as blacksmith on a sailing vessel, but would rather go farther south, as it is very warm near the Equator. I have a helper who would go with me, who is an excellent taxidermist, and between both, we think we could do well. *A.*—On general principles, our advice would be to stay where you are, if you are doing well. In another column we have touched somewhat upon the subject matter of your question. Your knowledge of Pernambuco should give you some idea of what you can expect to find at Rio Janeiro, minus the advantages of a better climate, and more settled country. Probably Valparaiso, Chili, would be a good point to aim for, if you have made up your mind to emigrate, and think you can stand the pressure.

Business Specials.

40 cts. a line for each insertion under this head.

Howard S. Abbot, Attorney at Law and Solicitor of Patents, 617 7th Street, N. W., Washington, D. C. Personal attention given to cases in Patent Office.

Wilkinson & Crowell, No. 506 Walnut St., Philadelphia. "Paragon" Piston-rod Packing, entirely metallic, automatic, frictionless, and practically free of steam pressure. Will work on high-speed or condensing Engines.

John A. Caldwell, Mechanical Engineer, 94 Liberty Street, New York.

Blowers for all purposes. Exeter Machine Works, 50 Federal Street, Boston.

Thomas D. Stetson, Patent Solicitor and Expert in Patent Cases, No. 23 Murray Street, New York.

American Watch Tool Co., Waltham, Mass., Whitcomb Watch Makers' Lathes, and Watch Machinery.

See Standard Turbine advertisement in last issue.

A 4½ in. 2 Jaw Chuck, Independent or Universal, for Brass Work. A. F. Cushman, Hartford, Conn.

Special Tools for Railway Repair Shops. L. B. Flanders Machine Works, Philadelphia, Pa.

Paper Making Machinery—Makers of above from fibrous material as wood, esparto grass, etc., send address to Joshua Rose, P. O. Box 3306, N. Y. City.

Rules for Engineers, and Removal of Scale in Boilers. Send for Circular. Ranken Scale Co., 50 Federal Street, Boston.

Dixon's Traction Belt Grease. Dixon's Founders' Perfect Wash. Dixon's Plumbago Foundry Facing. Dixon's Graphite Machine Grease. Dixon's Everlasting Graphite Axle Grease. Dixon's Dry American Graphite Perfect Lubricator. Send for explanatory circular to Dixon Crucible Co., Jersey City, N. J.

Manual of Power for Machines, Shafts, and Belts, with the History of Cotton Manufacture in the United States, by Samuel Webber, C. E., copyrighted 1879. Only work of the kind extant; 240 pages. Price $3. Address, D. Appleton & Co, New York, or the author, Manchester, N. H.

Sheet Metal Presses. Ferracute Co., Bridgeton, N.J.

Engines Indicated—Power Measured. W. H. Odell, Box 274, Yonkers, N. Y.

John Douglass, common and fine patterns made to order, also car wheels, working models, and experimental machinery. Shop at Washburn, Hunts and Co's Wheel Foundry, cor. Warren and Bay Sts., Jersey City, N. J.

Manufactures.

The Ames Manufacturing Company, of Chicopee, Mass., are erecting a large brick building in the rear of the machine shop, where more room is needed for sewing-machine work.

The first iron blast furnace in California is now in course of construction at the Clipper Gap iron mountain, on the Central Pacific Railroad, 182 miles from San Francisco.

The Northampton Emery-Wheel Company, Northampton, Mass., are putting up a new structure 70x30 feet, for preparing and curing wheels, which addition will double their capacity.

The Baldwin Locomotive Works at Philadelphia, are now employing nearly 2,800 hands, a larger number than ever before.

Allentown, Pa., has already subscribed $61,000 toward the erection of the silk mills in that city.

The Westinghouse automatic brake is now being applied to all the passenger locomotives built at West Albany.

The Duffy Tool Co., whose new works are at South Chicago, will soon be in full blast.

The Wilson Sewing Machine Company, Chicago, are talking of extending their main building 250 feet to the west. They are running 16 hours' time.

The Northwestern Horse Nail Company, Chicago, are busily engaged in constructing a quantity of new machinery for their works, which will enable them to add 25 per cent. to their present capacity.

The Payson Manufacturing Co., Chicago, manufacturers of hardware specialties, intend increasing their force to 30 or 40 hands soon.

The Marsh Harvester Company, have now nearly completed the main building of their new works in Lakeview, says the *Chicago Industrial World.* A library and reading room will furnish workmen a pleasant place to while away leisure hours improving their minds. The shops will have a capacity to employ 800 men, and expect to use the full capacity within a year. Their main buildings will be ready for active work about the first of November.

The Toledo, Delphos & Burlington Railroad Company have closed contracts for the extension of their road 250 miles from Kokomo, Ind., to St. Louis, making a trunk line from Toledo to St. Louis shorter than the Wabash. It is understood that a banking firm doing business in New York and Boston are backing the enterprise.

The State of Massachusetts has leased the Hoosac tunnel to the Fitchburg railroad for 74 years, for $68,000 a year.

The extensive mill-furnishing works of the Nordyke & Marmon Co., Indianapolis, Ind., are being enlarged by additions of new buildings and new machinery.

"Two thousand plows," says the Memphis *Avalanche*, "arrived on one steamer from the North a day or two since. What this country wants is more plows and less partisan politics to the acre."

The United pipe lines of Pennsylvania are negotiating for the purchase of a breech-loading cannon capable of discharging a three-inch ball, which will be kept in constant readiness to be removed to any place where a large tank may take fire. The critical time at such fire is when the burning tank overflows By perforating the tank with a shot, and drawing the oil off, the flames can be prevented in almost all instances from communicating with adjoining property.

An extensive factory for condensing milk is being erected at Shawangunk, Ulster county, N. Y.

The Orvis Plow Co., is the name of a new enterprise at Dixon, Ill. They have a capital of $25,000, and will manufacture the Orvis plow and other specialties.

Deere & Co.'s plow factory, at Moline, Ill., now employ 600 men, and turns out 500 plows and cultivators each day.

Owing to increasing demands, the Springfield, Mass., Sewing Machine Co., which now produces about 50 machines daily, are considering the project of enlarging their quarters.

The Columbus Iron Works, Columbus, Ga., have recently made large additions to their works, and are now employing 150 hands. They manufacture iron and brass into a great variety of machinery, tools, and implements, both for mechanical and agricultural purposes; build engines of from five horse power to one hundred horse-power; do railroad and steamboat work and make plantation implements.

A company has been organized among the shareholders of the Menominee Mining Company to build a blast furnace at Florence, Marinette county, Mich.

The Farmer Lathe-Drill & Tool Co.'s Boston agency has recently shipped a quantity of Farmer lathe-drills to London, England.

License to organize has recently been issued by the Secretary of State, of Illinois, to the Western Oakum Manufacturing Co., of Chicago; capital, $100,000. The coporators are W. E. Geer, E. J. Luturch, and S. H. Gillmore.

Dubuque, Iowa, is to have an addition to its manufacturing industries in the shape of a linseed oil mill. The Dubuque Linseed Oil Co. has just been organized, and will go into business at once.

The American Oak Leather Co., of Cincinnati, O., have commenced tannery buildings large enough to work 400 men.

The North Star Iron Works Co., is a new corporation which has purchased machine shops in Minneapolis, Minn.

J. H. Bufford's Sons, of Boston, have ordered a Lawrence engine for their new works at Dorchester.

Beggs & Son, Chattanooga, Tenn., founders, will immediately erect a machine shop, 35 × 60 feet.

The Albion Paper Co., of Holyoke, Mass., have begun the foundations for a new machine room. The building will be 104 × 84 feet.

Two large American steamers, laden with grain, recently entered the port of Revel in northern Russia, for the purpose of discharging their cargoes, a circumstance hitherto without precedent in the annals of Russian commerce.

The Prosser Twin Cylinder Car Co., of Chicago, has come to grief, one of its stockholders having filed a bill asking for a receiver on the ground of misappropriation of funds by the other managers. An injunction was granted restraining the latter from attempting to manage the affairs of the concern. Of the magnificent capital stock of $1,000,000, only a small part seems to have been disposed of.

Additional buildings have recently been erected by the St. Louis, Iron Mountain & Southern Railroad Company, at their car shops, in South St. Louis, which afford increased facilities for their car-building operations.

The Corrugated Metal Co., of East Berlin, Conn., are doing a larger business than ever before this season, and have now contracted for about 800 tons of bridge and general iron building work. Among other contracts, they have a $67,000 bridge for the city of Manchester, N. H., which, when completed, will be one of the largest highway bridges in the country. This bridge is what is known as a double deck—having a 40 foot roadway on the top and a 20 foot roadway below.

The River Iron Works, Camden, N. J., are building four iron steam vessels. Besides this, the works have a large amount of general machine work, and the present force of three hundred men will shortly be increased.

J. A. Allen is about to enlarge his machine shop and foundry at Adams, Mass. The latter will be doubled in capacity.

Many of the heaviest castings of the new engine for the rolling mill at Thomaston, Conn., are already in place, and the rest of the engine will soon be in position.

The Brown & Irwin foundry works, at Dayton, O., has been recently purchased by McHose & Lyon, who have remodeled and fitted them up to engage more extensively than heretofore in the architectural and wrought-iron fence business. They have heavy contracts on hand.—*Cleveland Trade Review.*

The Iron Clad Manufacturing Company, of New York, have just closed a contract for 100,000 square feet of their metallic shingles to cover some large commercial buildings in Guayaquil, Ecuador.

Powers & Brownlee's Iron Refining Works, at Struthers, O., are going to be removed to Cleveland.

The Russell Manufacturing Company, at Massillon, O., are building additions to their works, and preparing for a large turnout of machines and engines next year.

John Stoddard & Co. are making large additions to their agricultural implement manufactory at Dayton, O., having lately put up a large four-story brick addition.

The Geneva Sewing Machine Company, Geneva, O., expect to commence work in about six weeks.

The Roofing Tile Manufacturing Co., is a new concern lately incorporated in Chicago, for the manufacture of Taylor's Patent Roofing Tile.

The Pratt & Whitney Co., Hartford, Conn., are now running their shops with 525 hands. They are running night and day to fill their orders.

The Holyoke, Mass., Machine Company, are erecting a new brick building, 140x40 feet, three stories high, as a store house for coal, supplies and patterns.

The Merrick Thread Company, Holyoke, Mass., are making arrangements to build a new mill. The main building will be 300x90 feet, four stories high, the stock house, 106x 45 feet, two stories high, and the machine shop, 74x42, two stories. The first story of this latter will be used as a machine shop, and the second floor as picker room. There will be a new wheel house, 32x35 feet, and a boiler house, 62x50, both built of brick. The main building will have a tower at each end and one in the center on the rear side, for elevator, closets, &c.—*Boston Commercial Bulletin.*

Machinists' and Engineers' Supplies.

NEW YORK, September 30, 1880.

There is nothing new or remarkable in the condition of the supply market. Every dealer seems to be at his wits end to supply his orders. Prices remain unchanged and the demand is good.

Drop forgings difficult to obtain.

Hammers and sledges are still scarce.

Messrs. Beecher & Peck, of 157 Temple St., New Haven, Conn., have just issued a new illustrated catalogue of 34 pages describing the drop presses, hammers and lifters, with the latest improvements, also blast forges, dies and punches of different descriptions as manufactured by their firm.

Messrs. Poole & Hunt, of Baltimore, Md., have published a new circular also a pamphlet of 66 pages describing by appropriate illustrations the turbine water wheels manufactured by them. The pamphlet, in addition to the description of mill machinery, also contains a large amount of valuable information for the mill owner and miller.

Iron Review.

NEW YORK, September 30, 1880.

Prices have not changed during the week nor the general tone of the market. While the consumption of iron is very great, yet the productive capacity of the country, together with the foreign stocks still here, prevent any advance in prices. At public auction a large lot of old rails sold at $26.25, and this is about the price, although holders are very unwilling to sell at this, and generally anticipate better figures. There is a good demand for Foundry Irons while forge irons are more neglected. Bars are steady and prices little above cost of making if any.

We quote as follows:

Iron Rails, $50 to $53, according to weight; Fish Plates, 2¼c. per lb.; Railway Spikes, 3¼c.; Bolts and Nuts, 3½c.; Common Bar Iron, 2.4c., basis from store, Refined do. 2.6c., basis; Ulster, 3.6-10c. basis: Machinery Steel, 6½c.; Best Tool Steel, 13½c.; Norway Bar Iron, 6¼c.; Norway Shapes, 6¾c; Nail Rods, 6¾c.; Sheet Iron, 3½c., basis; Angle Iron, 3¼c.; Tee Iron, 3¾c.; Band Iron, 3.4c.; Hoop Iron, 3.6c., and up according to size; Horse Shoe Iron, 3.5c.; Hot Polished Shafting in lengths, 2 ft. and longer, 9 to 10½c., according to size; Small Black Rivets, 30% off in papers; 10% off in bulk.

Carmichael & Emmens, 130 Cedar St., New York, quote prices of Boiler Makers' Supplies from store as follows:

Flange Iron	5¼
C. H., No. 1, Shell Iron	4¼
C. No. 1 Iron	4
Tank Iron	3¾
Sheet Iron	3½
Angle Iron	3½
Bead Iron	5½
Burden Boiler Rivets	5 1-10

Boiler Tubes at 40 per cent. discount off list.

Metal Review.

LUCIUS HART & CO., 8 & 10 Burling Slip, New York, furnish us the following, under date of Sept. 30, 1880:

A stronger feeling pervades the metal market. Pig Tin strong in London at £84; Singapore, $26.50c. Demand fair. Would quote this market Banca Tin 25c.; Malacca and Straits 20c.; Australian, 19¾c. Billiton and refined, 19½c.; "Lamb & Flag" 19¼c.; Pig Lead, 5¼c. to 5¼c.; Antimony, 15½c. to 16½c.; as to brand, Spelter, Domestic, 5½c.; "Bertha," pure, 8¼c.; Silesian, 6c.; No. 1 Solder, 11c.; "Half and Half," 13c.; Bismuth, $2.50 to $3.00.

WANTED.

Wanted—Machinists—Six strictly first-class Vise hands and Fitters accustomed to building machine tools; liberal wages paid by Niles Tool Works, Hamilton, Ohio.

Wanted.—Situation as foreman in machine shop. Have had thirty years experience and used to any class of work. Address, William Fitton, Railroad St., 32d Ward, Mount Washington, Pittsburgh, Pa.

Wanted.—A Superintendent for a foundry and machine works now employing 67 hands. State class of work been accustomed to, and reference fully. Address Geo. R. Lombard & Co., Augusta, Ga.

Wanted.—A reliable second hand Richards Indicator. Address with price and particulars, C. W. N., office AMERICAN MACHINIST.

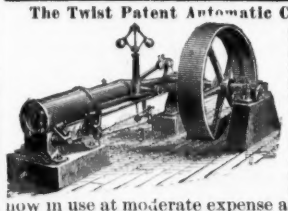
FOR SALE.

2 No. 2 Second-Hand MacKenzie Cupolas.
1 No. 2 " " " Blower.

APPLY TO

KNOWLES STEAM PUMP WORKS,
44 Washington St., Boston.

The Twist Patent Automatic Cut-off Engine



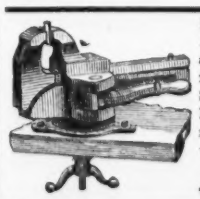
is a first-class Engine in every respect. The valve gear is of the disengaging type, is exceedingly simple, accessible & durable. Cylinders with this cut-off can be pieced on any engine now in use at moderate expense and will save from 30 to 50 per cent. in fuel over the plain slide valve and throttle governor. Also, Vertical and Yacht Engines.

NELSON W. TWISS,
25 Whitney Ave., New Haven, Conn.

A PARTNER WANTED.

The undersigned is proprietor of an extensive machine shop, foundry, blacksmith shop, &c., in Fond du Lac, Wis., stocked with first-class Tools, among which is a Planer for planing 20 feet long, 4 feet wide and 4 feet high, made by the Putnam Machine Co., also a Lathe of 7 feet swing and 20 feet bed, made by the same company. *The shops and Tools are nearly new,* and now running on Engines, which it is intended to make a specialty of manufacture, but owing to the pressure of other business the proprietor is *unable to give his personal attention* to the same, and, therefore, wishes to associate with himself a practical business man of experience in this line to take charge of the business, and who could also furnish a portion of the capital required. The business is free from all indebtedness, and the principal part of the capital necessary for operating the works can be furnished by the present proprietor. Address,

CHARLES J. L. MEYER, Fond du Lac, Wis.
September 25, 1880.



STEPHENS' PATENT PARALLEL VISE and attachments, adapted to every variety of work from Jewelers' to Locomotive Shops. It opens **further,** holds **firmer,** is **heavier** and more **durable** than any other vise. For sale by the trade.

Stephens' Patent Vise Co
41 Dey St., New York, U. S. A

BEECHER & PECK,

(Successors to Milo Peck),
Manufacturers of
PECK'S PAT. DROP PRESS.
Peck's Drop Lifter the only one that has its parts cushioned.
Send for illustrated Catalogue.
157 Temple St., New Haven, Conn.

GEO. W. FIFIELD,
Manufacturer of ENGINE LATHES
16 to 48 in. swing. Cuts, Photographs and Prices furnished on application.
LOWELL, MASS., U. S. A.

C. W. LeCOUNT,

South Norwalk, Connecticut,

Manufacturer of

LeCount's Improved Steel Dog

With hardened Steel Screws turned in the Lathe.

PRICES.

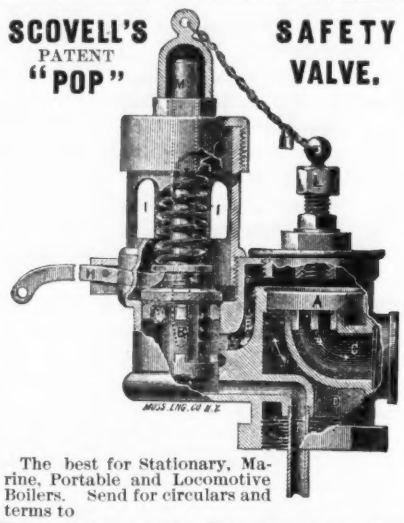
No. 1....	⅜ in...	$ .40
" 2....	½ "	.50
" 3....	¾ "	.60
" 4....1	"	.70
" 5....1¼	"	.85
" 6....1½	"	.95
" 7....1¾	"	1.10
" 8.. 2	"	1.20

SMALL SET, $6.30.

No. 9...2½	in....	1.40
" 10.. 3	"	1.60
" 11...3½	"	1.80
" 12...4	"	2.00

FULL SET, $13.00.

SCOVELL'S PATENT "POP" SAFETY VALVE.



The best for Stationary, Marine, Portable and Locomotive Boilers. Send for circulars and terms to

The Hancock Inspirator Co.
34 Beach Street, Boston, Mass.

Back Numbers Wanted.

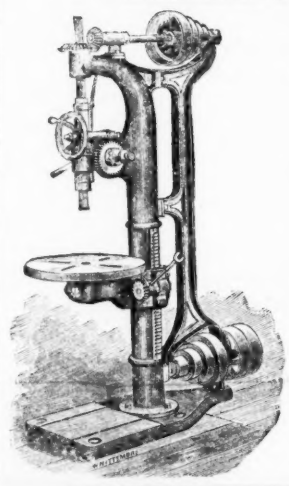
We desire to correspond with parties who can furnish us clean copies of the AMERICAN MACHINIST of the following issues:

Vol I, Nos. 1, 3, 9 and 11.
Vol. II, No. 2.

American Machinist Publishing Co.
96 Fulton St., New York.

PRENTICE BROTHERS,

Manufacturers of



Machinists' Tools,
Engine Lathes,
11, 14 and 16 in. swing,
Hand or Speed Lathes,
from 10 to 20 in. swing.
Foot Power Lathes,
Upright Drills,
Slide Rests,
Planer Centers, &c.
WORCESTER, MASS.

KEARNEY & FOOT

Office, No. 78 Chambers Street, N. Y. | **Full Weight Hand-Cut Files.** | Manufactory, PATERSON, N. J.

The best and cheapest in the end. Send for quotations. The files speak for themselves in the following testimonials. Read them.

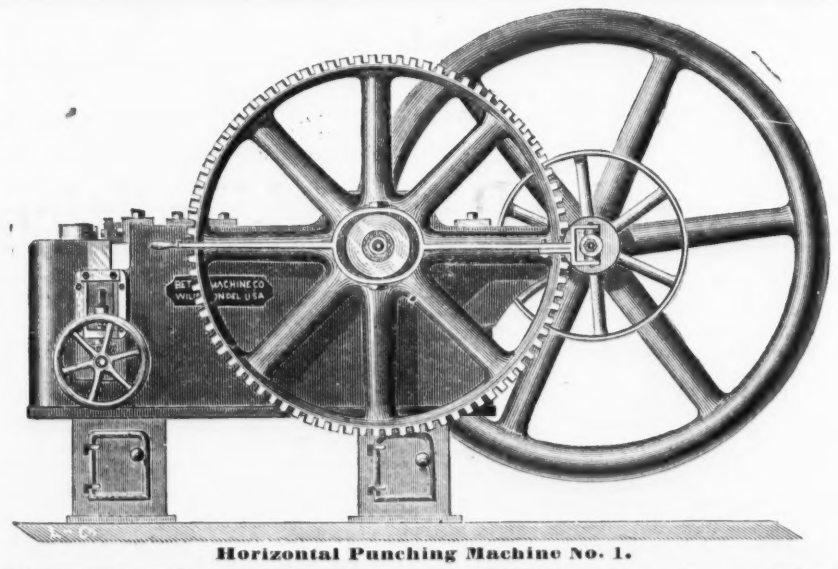
Messrs. KEARNEY & FOOT, Brooklyn, N. Y., May 24th, 1877.

Gentlemen:—We have used your Files, more or less, for several years, and we take pleasure in saying that both the new and re-cut Files have given entire satisfaction. Yours truly,
BLISS & WILLIAMS.

FARREL FOUNDRY AND MACHINE CO.
JAS. D. FOOT, Esq., Waterbury, Conn., Nov. 8th, 1878.

Dear Sir:—Please forward the order for Files given you a few days since.
Your Files have been uniformly satisfactory to us. Yours respectfully,
FARREL FOUNDRY & MACHINE CO., E. C. LEWIS, Ag't.

We print instructions on the use of Files, and also give the diameters of round and square Files from 3 to 16 inches. They are on card board, 10x12 in., and are intended to be put up in the shop for the men to read. We are pleased to mail them to any manufacturer on receipt of the necessary 6 cents postage.
Respectfully, **KEARNEY & FOOT.**



Horizontal Punching Machine No. 1.

BETTS MACHINE CO., Wilmington, Del.

MAKERS OF

Tools for Machinists, Boiler Makers, Locomotive Shops and Bridge Builders; also, Standard Gauges, Measuring Machines and Adjustable Reamers.

NICHOLSON FILE CO.

SOLE MANUFACTURERS OF

FILES AND RASPS

HAVING THE INCREMENT CUT.

Also, FILERS' TOOLS and SPECIALTIES.

"Nicholson File Co's" Files and Rasps.
"Double Ender" Saw Files.
"Slim" Saw Files.
"Racer" Horse Rasps.
Handled Rifflers.
Machinists' Scrapers.
File Brushes, File Cards.
Surface File Holders.
Vice File Holders.
Stub Files and Holders.
Improved Butchers' Steels.

Manufactory and Offices at PROVIDENCE, R. I., U. S. A.

NEWARK STEEL WORKS.

BENJAMIN ATHA & CO.

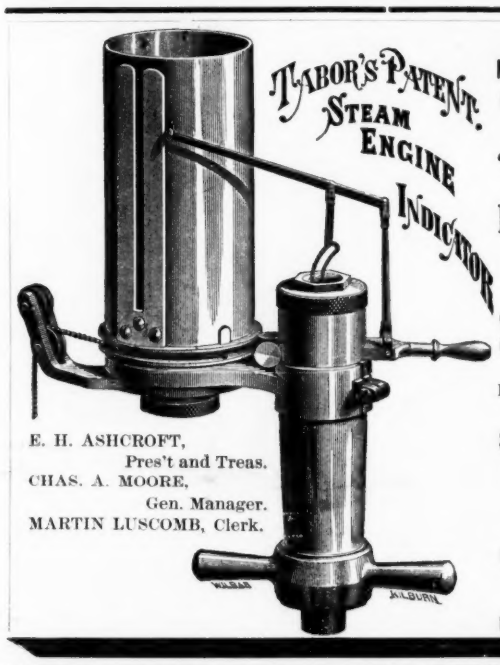
MANUFACTURERS OF

CAST STEEL

WE MAKE GRADES OF STEEL SPECIALLY ADAPTED TO THE MANUFACTURE OF LATHE TOOLS, CHISELS, TAPS & DIES

BENJ. ATHA. NEWARK, NEW JERSEY. J. ILLINGWORTH.

ESTABLISHED 1851.



E. H. ASHCROFT, Pres't and Treas.
CHAS. A. MOORE, Gen. Manager.
MARTIN LUSCOMB, Clerk.

The Ashcroft Manufacturing Co.

Successors to E. H. ASHCROFT,
"Original Steam Gauge Works."
THE E. H. ASHCROFT
Improved "Bourdon" Steam Gauges.
Sole Owners and Manufacturers of
TABOR'S PATENT
STEAM ENGINE INDICATORS.
Specially adapted to
Indicating High Speed Engines and Locomotives.

STEAM AND WATER GAUGES,
Railway, Steamship & Machinery Supplies.
WAREROOMS:
Nos. 51 & 53 Sudbury St., and 8, 10, 11, 12 & 14 Bowker Street,
BOSTON, MASS.
Factories, BOSTON & LYNN.

RALPH R. OSGOOD'S BOOM DREDGE.

Adapted to all kinds of under-water excavation. Guaranteed to excavate 50 per cent. more material from hard bottom than any other machine made, all things being equal. Illustrative pamphlets, comparative strain sheets and estimates furnished on application. ☞ See AMERICAN MACHINIST of July 31, 1880. Address

RALPH R. OSGOOD, Troy, N. Y.

☞ When in New York City will be 81 Astor House.

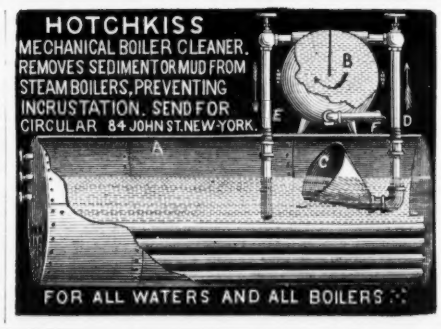
DRAWING INSTRUMENTS

AND MATERIAL, PAPER, &C.

G. S. WOOLMAN,

116 Fulton Street, New York.

Fully priced and illustrated Catalogues.



AKRON IRON COMPANY,

AKRON, O.

SOLE MANUFACTURERS OF

Patent Hot Polished Shafting.

This shafting commends itself to the trade generally as superior to any shafting ever before introduced to the market for the following reasons, viz.:

1st.—It is perfectly straight and round.

2d.—It can be rolled accurately to any desired gauge.

3d.—It has the beautiful blue finish of Russia Sheet Iron, rendering it less liable to rust or tarnish than shafting of the ordinary finish.

4th.—It will NOT SPRING OR WARP IN KEY SEATING like most of the other manufactured shafting sold in the market, and, as a consequence, is admirably adapted for LINE AND COUNTER SHAFTING.

5th.—The surface is composed of MAGNETIC OXIDE OF IRON, forming a superior journal or bearing surface.

6th.—It is made of superior stock.

Price lists, with references and other information, furnished on application to us.

Or to our Agent, AKRON IRON CO., Akron, Ohio.

E. P. BULLARD, 14 Dey Street, New York City,

General Agent for N. Y. City and other Eastern States.

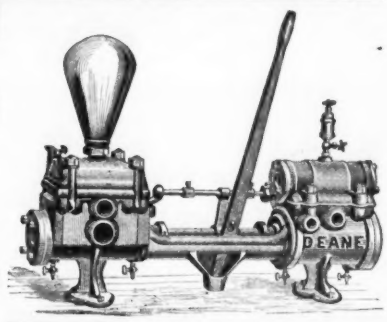
DEANE'S PATENT STEAM PUMPS

FOR SIMPLICITY OF MECHANISM

—AND—

EFFICIENCY IN OPERATION

THEY ARE UNEQUALED.



MANUFACTURED BY THE

DEANE STEAM PUMP CO.

HOLYOKE, MASS.

WAREROOMS: 92 and 94 LIBERTY STREET, NEW YORK, 7 OLIVER STREET, BOSTON. Send for Illustrated Catalogue and Price List.

Branch Office, 46 & 48 WEST LAKE STREET, CHICAGO, ILL.

BRADLEY'S CUSHIONED HELVE HAMMER.

Awarded first premium, Silver Medal at American Institute Fair, 1873, Cincinnati Industrial Exposition, 1874, and the Diploma of Honor and Grand Medal of Merit at the Centennial Exhibition, in 1876,

Being the highest award given any goods of their class in America or Europe.

IT HAS MORE GOOD POINTS, LESS COMPLICATION,
MORE ADAPTABILITY, LARGER CAPACITY,
DOES MORE AND BETTER WORK, TAKES LESS POWER,
COSTS LESS FOR REPAIRS
THAN ANY HAMMER IN THE WORLD.

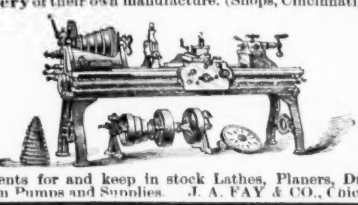
Guaranteed as represented. (Established 1832.)

BRADLEY & COMPANY, Syracuse, N. Y.

CHRISTIANA MACHINE Co's SPECIALTIES.

PORTABLE · BURR · MILLS
MILL & FACTORY GEARING.
CIRCULAR SAW MILLS
with improved Ratchet head blocks
STEAM ENGINES.
SHAFTING PULLEYS AND HANGERS.
TURBINE WATER WHEELS
AND MILLING SUPPLIES.
ADDRESS. CHRISTIANA, LANCASTER Co. Pa.

J. A. FAY & CO. (CHICAGO STORE,) Keep in stock a full line of Wood-Working Machinery of their own manufacture. (Shops, Cincinnati, O.)



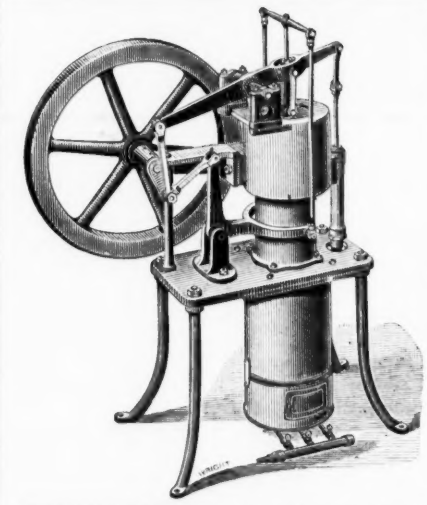
Agents for and keep in stock Lathes, Planers, Drills, Steam Pumps and Supplies. J. A. FAY & CO., Chicago.

Mechanical Books.

Send 10 cents for 96 page Catalogue of Books for Machinists and Engineers.

D. VAN NOSTRAND,

23 Murray & 27 Warren Sts., New York.



ERICSSON'S NEW PATENT CALORIC PUMPING ENGINE is specially intended for domestic use in lifting and forcing water from wells and cisterns, or from Croton pipes, to tanks on upper floors of buildings in city or country.

This pumping engine is entirely safe, no steam being employed, and is not liable to derangement.

All kinds of fuel will answer for this engine, but coal-gas is preferable, the consumption being only 15 cubic feet per hour. Besides gas is handier and cleaner than coal or other combustibles. Servant girl can operate it!

Price for 8-inch cylinder, pumping 250 gallons per hour 50 feet: With gas furnace, - $260 00; With coal furnace, - 275 00
Price for 6-inch cylinder, pumping 200 gallons per hour 50 feet: With gas furnace, - $210 00; With coal furnace, - 220 00

Manufactured by the Delamater Iron Works.
C. H. DELAMATER & CO., Proprietors,
No. 10 CORTLANDT ST., N. Y. CITY.

COLUMBIA BICYCLE.

Bicycle riding is unsurpassed as a method of traveling, whether for speed, sport, or the renewal of health. The practicability of the machine has been thoroughly tested, and satisfactorily proved beyond question. Thousands are in daily use, and the number is rapidly increasing. The exercise is recommended by the medical profession as most beneficial to health, bringing into action almost every muscle of the body. Send 3c. stamp for illustrated catalogue containing price list and full information.

THE POPE MFG. CO.

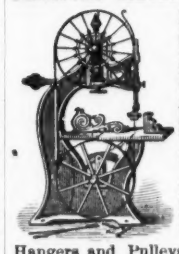
47 Summer St., Boston.

WOOD WORKING MACHINERY.

J. A. FAY & CO.,

BUILDERS OF

IMPROVED MACHINERY FOR WOOD CUTTING.



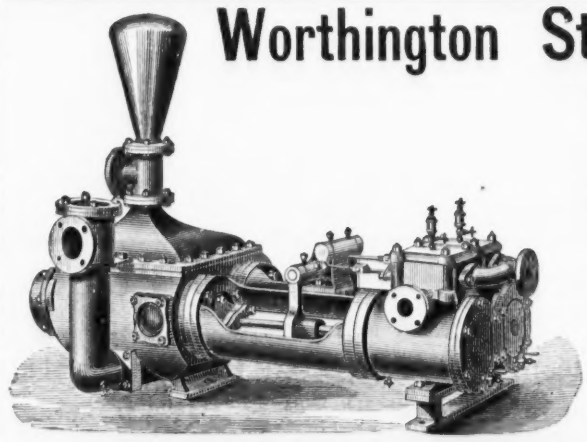
Numbering some 300 different Machines—Planing and Matching Machines, Surface Planing Machines, Molding and Tenoning Machines, Mortising and Boring Machines, Carving and Dovetailing Machines, Shafting and Friezing Machines, Horizontal and Vertical Boring Machines.

Improved Variety & Universal WOOD WORKERS.

Band, Scroll, Ripping and Cutting-off Saws, Band and Circular Resawing Machines, Spoke and Wheel Machinery, Shafting, Hangers and Pulleys, etc., etc. Original in design, simple in construction, perfect in workmanship, saves labor, economizes lumber, and its productions are of the highest standard of excellence. *Send for Circulars and Prices.*

J. A. FAY & CO., Cincinnati, Ohio, U.S.A.

Worthington Steam Pump.



For all Purposes and of all Sizes.

SPECIAL PATTERNS

FOR

Railway Water Stations, Oil Pipe Lines, Hydraulic Elevators, etc.

SEND FOR LATEST CIRCULAR.

HENRY R. WORTHINGTON,

239 BROADWAY, NEW YORK. 83 WATER ST., BOSTON. 709 MARKET ST., ST. LOUIS.

Largest Establishment of the Kind in the World.

MOSS ENGRAVING CO.

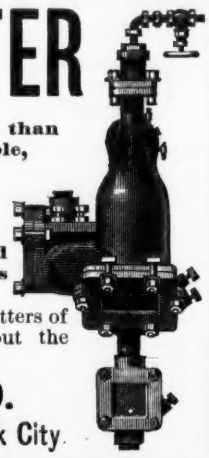
J. C. MOSS, Pres't and Sup't. *Incorporated April 2, 1880.* J. E. RAMSEY, Secretary.
R. B. MOSS, Ass't Sup't.
M. A. MOSS, Treasurer. **MOSS' NEW PROCESS.** H. A. JACKSON, Ass't Sec'y.

535 PEARL STREET, COR. ELM, NEW YORK.

IMPORTANT TO MACHINERY MANUFACTURERS AND DEALERS.

Engraved Plates for Newspaper, Book and Catalogue Illustrations, &c., executed in Type Metal in a superior manner by a new and improved photo-chemical method, from all kinds of Prints, Pen Drawings, Photographs, Tin Types, Original Designs, Pencil Sketches, and, when available, from the object itself. *Much Cheaper than Woodcuts.* These plates are mounted type high, ready for use on any ordinary press, and are guaranteed to be fully equal to the best woodcuts. Electrotypes can be made from them in the usual manner. We also have a fully equipped steam electrotyping department. Engravings of **MACHINERY** of all kinds executed in the highest style of the art at reasonable prices. **Mr. Moss, in withdrawing from the Photo-Engraving Co., 67 Park Place, has retained for himself all improvements made and used by him in Photo-Engraving since May, 1872.** Our motto is, "The Best Work at Low Prices. Always on Time." Send stamp for illustrated circular. Send copy for estimate. Please mention this paper.

THE NEW PULSOMETER



Will save over Fifty per cent. in Fuel with greater duty than any other Steam Pump in the market; also, more Simple, Durable and Compact. Specially adapted to Mining, Railroads, Steamboats, Paper Mills, Chemical and Gas Works, Tanneries, Breweries, Sugar Refineries and other Manufactures. For Draining Quarries, Cellars, Plantations, and various other purposes. For Contractors' use it has NO EQUAL.

Send for book giving full description, reduced prices, and many letters of commendation from leading manufacturers and others throughout the country who are using them.

PULSOMETER STEAM PUMP CO.

P. O. Box No. 1533. Office, No. 83 John St., New York City.

UNITED STATES METALLIC PACKING CO.

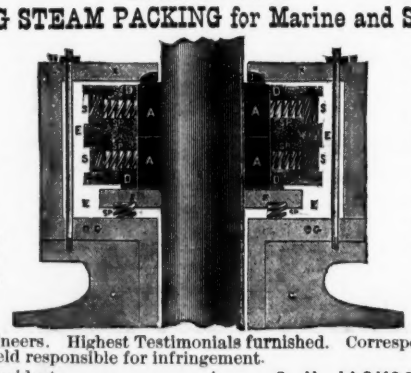
MANUFACTURERS OF

SELF-ADJUSTING STEAM PACKING for Marine and Stationary Engines.

PATENTED.

February 10th, 1863.
March 7th, 1871.
October 8th, 1872.
April 21st, 1874.

Other Patents Pending.



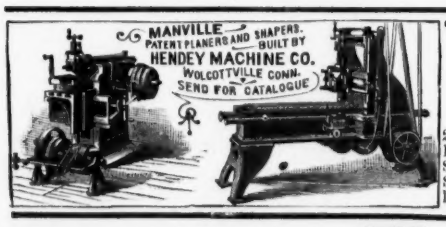
SECTIONAL VIEW.

A A—Packing Blocks.
C C—Ring enclosing Blocks
D D—Projections for Springs and Set Screws.
E E—Space for Vibration.
F F—Follower.
G G—Cylinder Head.
S S—Set Screws.
S B—Stud Bolts.
J—Ball Joint.
O G—Gland.
S P—Springs.
X X—Case.
R—Rod.
S—Set Screws.

Endorsed by leading engineers. Highest Testimonials furnished. Correspondence solicited. Makers, Sellers and Users will be held responsible for infringement.

EDW. CUNNINGHAM, President.
JOSIAH A. OSGOOD, Superintendent, 85 Devonshire Street, Boston, Mass.

C. H. JACKSON, General Agent, **34 Coal & Iron Exchange, New York.**



The Hendey Machine Co.

WOLCOTTVILLE, CONN., U. S. A.

Manville Patent Iron Planers and Shapers.

15 in. Shapers, 24 in. Shapers, 3½ ft. x 16 in., 5 ft. x 20 in., 6 ft. x 24 in., 8 ft. x 24 in. Planers, Amateurs' Hand Planers, with chuck and centers, Hollow Steel Spindle Hand Lathes, Brass and Wire Slitters, Spring Chuck, and Common Clock Lathes. Catalogue gives many names of users of our tools.

CHAS. G. LUNDELL,

No. 7 Exchange Place,

BOSTON,

MASS.

REPRESENTING

SWEDISH IRON

EKMAN & CO.

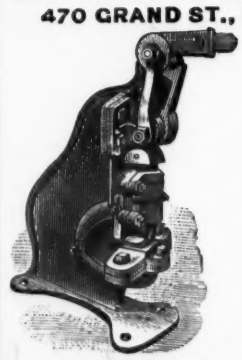
GOTHENBURG,

SWEDEN.

E. LYON & CO.

470 GRAND ST., NEW YORK.

Sole Manufacturers of



HYDRAULIC JACKS AND PUNCHES,
HYDRAULIC PRESSES,
HYDRAULIC PUMPS,
POLISHING AND BUFFING MACHINERY.

Shears and Punches for Round, Square and Flat Irons.

GEO. H. BARRUS,

EXPERT ENGINEER,

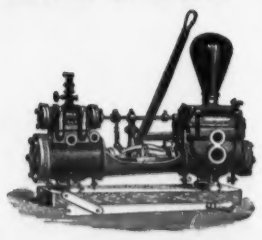
87 MILK ST., BOSTON.

May be consulted on matters relating to the generation and use of STEAM and the arrangement of New Works.

Expert Tests

made on ENGINES, BOILERS, and **STEAM PUMPING MACHINERY.**

KNOWLES' IMPROVED STEAM PUMPS,



THE STANDARD!

Steam Pumps for Every Possible Service.

SEND FOR ILLUSTRATED CATALOGUE.

KNOWLES STEAM PUMP WORKS,

86 Liberty Street, NEW YORK. | *44 Washington Street,* BOSTON.

The E. HORTON & SON CO.

Prices Reduced.

Windsor Locks, Conn.

MANUFACTURERS OF

THE HORTON LATHE CHUCK,

BOTH

INDEPENDENT AND UNIVERSAL,

ALSO THE

Horton Car Wheel Chuck.

FEBRUARY 1st, 1880.

From this date a discount of 25 per cent. will be made from the list price of The Horton Lathe Chuck,

Soliciting your orders, we are, respectfully yours.

Send for Price List. THE E. HORTON & SON CO.

Monitor Binders for the American Machinist,

$1.00 EACH BY MAIL OR EXPRESS.

JARVIS PATENT FURNACE

FOR SETTING STEAM BOILERS.

Economy of Fuel, with increased capacity of Steam Power.

The same principle as the SIEMENS' PROCESS OF MAKING STEEL, utilizes the waste gases with hot air on top of the fire.

Will burn all kinds of waste fuel without a blast, including screenings, wet peat, wet hops, sawdust, logwood chips, horse manure, &c.

A. F. UPTON, General Agent,

Send for Circular. 7 Oliver St., (P. O. Box 3401) Boston, Mass.

BARKER & BERTON. New York Agents, 422 East 23d St.

TOOLS & SUPPLIES

JACKSON & TYLER
BALTIMORE.

SEND FOR ILLUSTRATED CATALOGUE.
TAPS, DIES, DRILLS, CHUCKS, LATHES, FINE TOOLS.

E. E. GARVIN & CO.

Manufacturers of

Milling Machines, Drill Presses,

No. 4 Milling Machine.

Hand Lathes, Tapping Machines, Cutter Grinders and Wood Planers. Milling Cutters, all shapes and sizes. Gear Cutting and Milling in all its branches.

139-143 CENTRE ST.

Cornell's B'ld'g NEW YORK.

☞ Send for illustrated Catalogue.

Small Tools of all kinds; GEAR WHEELS, parts of MODELS, and materials of all kinds. Catalogue free. GOODNOW & WIGHTMAN, 175 Wash'ton St., Boston, Mass.

Dead Stroke

POWER HAMMERS

Are superior to all others for Forging and Die Work. Over 500 now in use.

Manufactured by

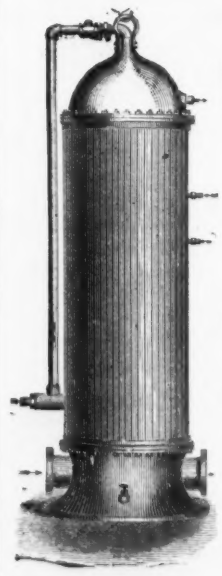
PHILIP S. JUSTICE,

14 N. 5th St., Philadelphia, Pa.

STRONG'S PATENT

Feed Water Heater and Filter,

Absolute Preventive of Incrustation.



MANUFACTURED BY

I. P. MORRIS CO.

PHILADELPHIA.

SALES AGENTS:

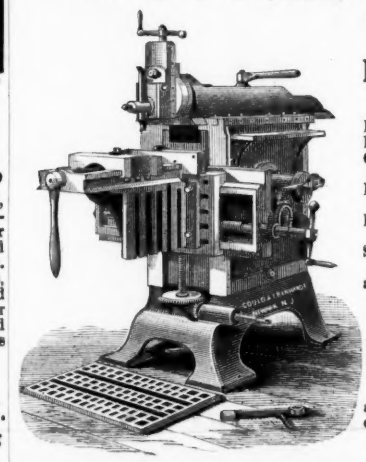
KELLY & LUDWIG, 720 to 724 Filbert Street, PHILADELPHIA.

WALWORTH MF'G CO. Kilby Street, BOSTON.

FRANK H. POND, 709 Market Street, ST. LOUIS.

E. GOULD & EBERHARDT,

97 to 113 N. J. R. R. Ave., Newark, N. J.



Builders of Lathes, Shapers, Planers, Bolt and Gear Cutters, Drawing, Drill, Drop, Foot, Screw, Power and Bank Note Printing Presses, Mortising Machines, Stone Crushers and Special Machinery.

The Raymond Mfg. Co.'s

PATENT

Non-Conductor Coverings for

STEAM PIPES AND BOILERS.

Sectional Air-Space Covering.

American Ash Felting.

Awarded Medal and Diploma at Centennial Exposition.

HAIR FELT & PLASTIC CEMENT.

FACTORY: 642 W. 52d Street, ☞ Send for Circulars. | OFFICE: 108 Liberty Street, NEW YORK.

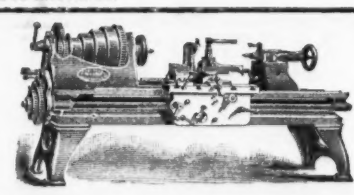
WOOD & DRAKE,

71 Rutger St., New York City.

Machinery Bought, Sold and Exchanged.

A general assortment of Engines, Boilers, Pumps, &c. (both new and second-hand) constantly on hand.

Parties having Machinery they wish to sell will do well to inform us.



New Haven Manf'g Co.

NEW HAVEN, CONN.

Iron-Working Machinery,

PLANERS. SHAPERS. DRILLS.

CARMICHAEL & EMMENS,

130, 132 & 134 Cedar Street, New York,

DEALERS IN

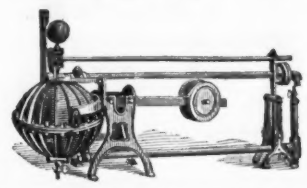
Iron and Steel Boiler Plate,

LAP WELDED BOILER TUBES, &c., &c.

Agent for Otis Celebrated Cast Steel Boiler Plates; the Coatesville Iron Co.; Pottstown Iron Co.; the Laurel Rolling Mills and Union Tube Works.

Wrought Iron Beams, Angles, Tees, Rivets, &c.

THE ALBANY STEAM TRAP.

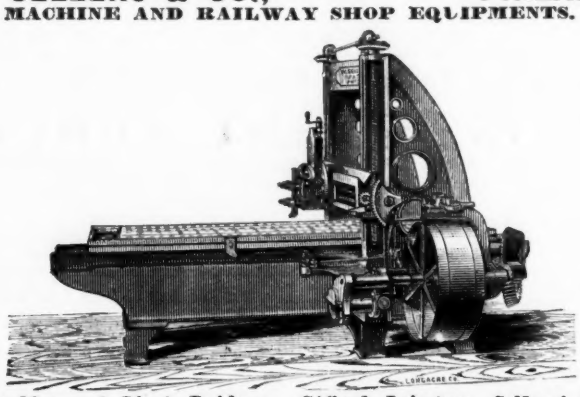


This Trap automatically drains the water of condensation from HEATING COILS, and returns the same to the Boiler, whether the coils are *above or below* the water level in Boiler, thus doing away with pumps and other mechanical devices for such purposes. Address

ALBANY STEAM TRAP CO.,
ALBANY, N. Y.

WILLIAM SELLERS & CO., - - - PHILADELPHIA.
MACHINE AND RAILWAY SHOP EQUIPMENTS.

Shafts, Couplings, Hangers, Pulleys, Mill Gearing, Etc.



Lathes, Planers, Drills, Shapers, Bolt Cutters, Etc.

Railway Turntables and Pivot Bridges. Gifford Injectors, Sellers' Improvements.
NEW PATTERNS. SIMPLE, EFFECTIVE.
NEW YORK OFFICE, 79 LIBERTY STREET.

R. HOE & CO.

Printing Press,

Machine and Saw

MANUFACTURERS,

Grand, Sheriff, Broome & Columbia Sts.
29 & 31 Gold Street.

Principal Office, 504 Grand St., cor. Sheriff,

NEW YORK.

P. BLAISDELL & CO.
MANUFACTURERS OF

Machinists' Tools,

Worcester, MASS.

WILEY & RUSSELL MF'G CO.
GREENFIELD, MASS.
Lightning Screw Cutting Machinery and Tools.

SEND FOR ILLUSTRATED PRICE LIST.

POOLE & HUNT, BALTIMORE.

MANUFACTURERS OF

THE POOLE & HUNT LEFFEL TURBINE

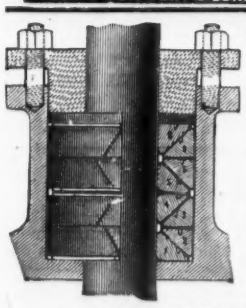
WATER WHEELS,

MACHINE MOULDED MILL GEARING,

SHAFTING, PULLEYS AND HANGERS,

STEAM ENGINES AND BOILERS,

MIXERS FOR FERTILIZERS AND CHEMICALS.



KATZENSTEIN'S
Self-Acting Metal Packing,
For Piston Rods, Valve Stems, &c.
of every description,
For Steam Engines, Locomotives, Pumps, &c., &c.
Adopted and in use by the principal Iron Works, Engine Builders and Steamship Companies within the last eight years in this and foreign countries.
For full particulars and references address

L. KATZENSTEIN & CO.,
35 Desbrosses St., New York.

F. W. MOSS,

80 John Street, New York,
(Successor to Joshua Moss and Gamble Bros.,)

Steel and Files,

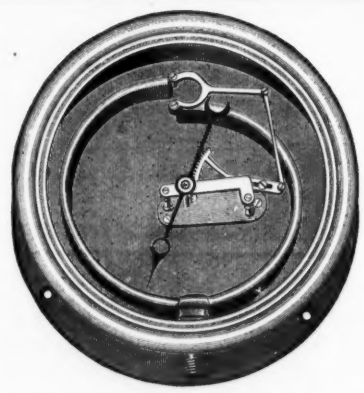
HAMMERS, ANVILS, VISES AND BLACKSMITHS' TOOLS.

WARRANTED CAST STEEL,
Specially adapted for Dies, Punches, Turning Tools, Drills, &c. Also

IMPROVED MILD-CENTRED CAST STEEL

For Taps, Reamers, Milling Tools, &c.

Warranted not to crack in hardening Tools of any Size.



CROSBY STEAM GAGE & VALVE CO.
J. H. MILLETT, Pres't.
GEO. H. CROSBY, Sup't. GEO. H. EAGER, Treas.
Sole Proprietors and Manufacturers of

CROSBY'S

Adjustable "Pop" Safety Valve.
Self-Regulating Reducing Valve.
Improved Steam Pressure Gage.
Self-Closing Water Gage.
Improved Steam Engine Indicator.
Sole Manufacturers and General Agents for
The "VICTORY" Steam Cylinder Lubricator.
And all instruments of this class. Send for Illustrated Catalogue.
Cor. Milk & Batterymarch Sts., Boston.

"BELTOLEUM,"

THE BEST PREPARATION FOR LEATHER BELTING IN THE MARKET.

Makes it soft and pliable, producing no sponginess. Contains no gummy or fatty oils that soon become rancid, thereby causing leather to dry and crack. Nor does it contain tallow, resin, acid or residuum, but is a harmonious union of the best ingredients of the

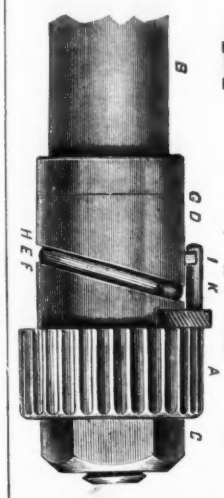
Animal, Vegetable & Mineral Kingdom.

Being an oil, it is always ready for use, and may be applied when belts are running, and will keep them in fine condition.

It is clean to use, as it penetrates the pores and leaves nothing on the surface to collect dust and dirt.

Sent to responsible parties on trial when desired. Send for circular. Put up in Cans and Barrels.

A. H. DOWNER,
Inventor and Sole Manufacturer,
Office, 17 Peck Slip, New York.



NEW MECHANICAL MOVEMENT.

Patented March 9th, 1880.

A POSITIVE AND PERFECTLY NOISELESS SUBSTITUTE FOR PAWL AND RATCHET.

Edward Wright & Co.
561 Main St.,
WORCESTER,
MASS.

Pattern and Brand Letters.

VANDERBURGH, WELLS & CO.
Printers' and Engravers' Warehouse,
Corner Fulton and Dutch Sts.,
NEW YORK.

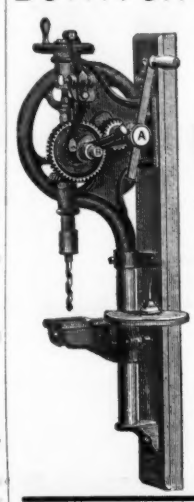
HEADQUARTERS

for every description of

MECHANICS' TOOLS.

A. J. WILKINSON & CO.
Illustrated Catalogue Free. BOSTON, MASS

BOYNTON & PLUMMER,



Manufacturers

IMPROVED

Patent Drills,

Adapted to Blacksmiths' and Carriage Makers' Use.

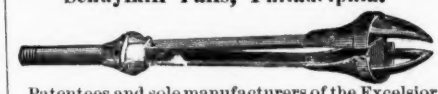
Bolt Cutters and Tire Benders.

From New and Improved Patterns. Also,

Hand and Power Shapers.

54 Hermon Street,
WORCESTER, MASS.

WE CHALLENGE THE WORLD FOR ITS EQUAL.
RUFFNER & DUNN,
Schuylkill Falls, Philadelphia.



Patentees and sole manufacturers of the Excelsior Steel Tube Cleaners. $1.00 per inch. Most liberal discounts to dealers. Send for circular.

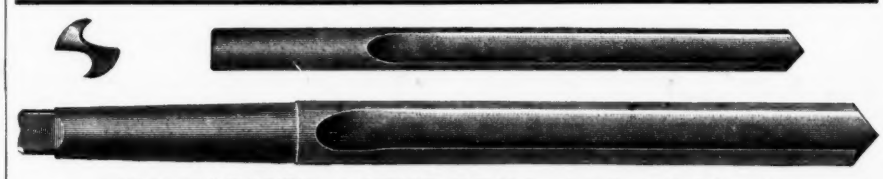
The Huntington Emery Wheel Dresser.

(IMPROVED.)

Invaluable to Users of Emery Wheels.

Thousands in Successful Use.

For Truing, Shaping, Sharpening and Removing Glaze from Solid Emery Wheels.
Price $4.00. Send for Circular. **CHICAGO SCREW CO.**
Cor. West Washington & Desplaines St., CHICAGO, ILL.



THE FARMER LATHE-DRILL AND TOOL CO.
LEOMINSTER, MASS., U. S. A.
MANUFACTURERS OF

Drills and Machinists' Small Tools.

Attention given to making Drills for special purposes, **either straight flute, or twisted** Also, manufacturers of the **NEW PATENT LATHE-DRILLS,** to which we would call the attention of those who work in Copper, Brass, and the softer metals. For price list and further information address as above, or

L. B. RUSSELL, Gen. Agent, 96½ Summer St., Boston, Mass.

SAMUEL A. BECKETT, Mechanical Engineer. FREDERICK H. McDOWELL, Engineer of Mines.

Beckett & McDowell,

MINING AND MECHANICAL ENGINEERS

AND MANUFACTURERS OF

Steam Engines and Mining Machinery,

Office, 17 COURTLANDT ST., NEW YORK.

Works at Arlington, N. J.

A. F. Prentice & Co.

Manufacturers of

Light Machinists' Tools.

Improved Upright Drills, with Lever Feed and Wheel F with Quick Return Motio

Hand and Foot Power Lathes.

SLIDE RESTS.

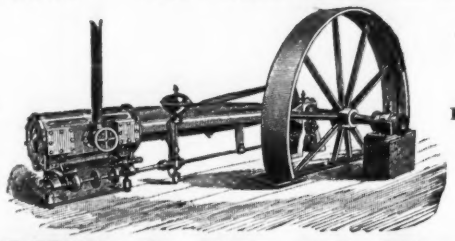
Special Machinery and Machine Jobbing.

FOOT POWER LATHES A SPECIALTY.

54 Hermon Street,
WORCESTER, MASS.

THE "BROWN" AUTOMATIC CUT-OFF ENGINE.

UNEXCELLED FOR **WORKMANSHIP, ECONOMY** AND **DURABILITY.**



WRITE FOR PRICES AND INFORMATION.

C. H. BROWN & CO., Sole Manufacturers,
FITCHBURG, MASS.

THE
LAWRENCE ENGINE,

A FIRST-CLASS AUTOMATIC CUT-OFF STATIONARY

ENGINE.

Highest Economy. *Best Workmanship at a Moderate Price.*

ARMINGTON & SIMS, - LAWRENCE, Mass.
A. F. UPTON, New England Agent, 7 Oliver Street, Boston.

H. PRENTISS AND COMPANY

14 DEY STREET, NEW YORK.

Agency of

THE TANITE CO. — THE UNIVERSAL LATHE DRILL,
REYNOLDS & CO. — BURNES PAT. DIE STOCK,
BILLINGS & SPENCER CO. — DEVERALL'S PAT. OILERS,
H. L. SHEPARD & CO., and for — Etc., Etc.

A. ALEX. POOL & CO.

NEWARK, N. J.
Manufacturers of
Combined Lathes and Milling Machines
FOR TOOL MAKERS' USE, also
Universal Milling Machines, Grinding Machines

CHARLES MURRAY.
ENGRAVER ON WOOD.
No. 58 ANN ST.
NEW YORK.

THE NASON MANUFACTURING CO.

DESIGNERS AND CONSTRUCTORS OF

STEAM AND HOT WATER APPARATUS.

FOR

PUBLIC BUILDINGS, HOTELS, APARTMENT HOUSES, STORES & DWELLINGS.

PARTICULAR ATTENTION GIVEN TO THE PREPARATION OF SPECIFICATIONS & ESTIMATES.

Nos. 71 Beekman and 71 Fulton Sts., New York.

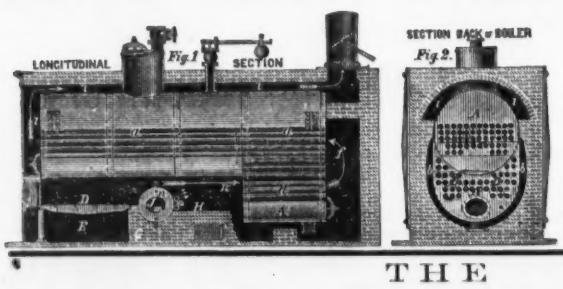
BOILERS. RADIATORS. VENTILATING FANS.

MONTGOMERY BOILER AND MACHINE WORKS.

WM. T. BATE & SON, East Conshohocken, PENNA.

MANUFACTURERS OF

Bate's Patent Steam Generator.



Iron Founders,
Boiler Makers AND
Machinists.

A large number of these boilers in use in the best establishments and institutions, showing **Splendid Results** in the way of economy, efficiency, durability and convenience of cleaning. We refer to parties using. Write for particulars.

THE
HANCOCK INSPIRATOR CO.

MANUFACTURERS OF

INSPIRATORS, EJECTORS,

—AND—

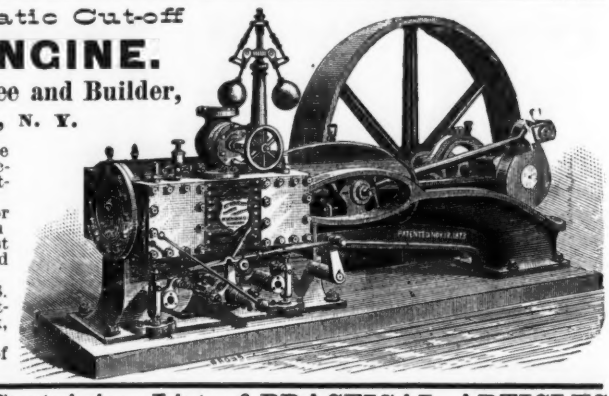
GENERAL JET APPARATUS,

34 Beach Street, Boston, Mass.
35 Queen Victoria St., London, England.

Patent Automatic Cut-off

STEAM ENGINE.

Wm. Wright, Patentee and Builder,
NEWBURGH, N. Y.



The most economical in the use of fuel, the simplest in construction, and altogether the best cut-off engine in the market.

COMPOUND ENGINES for City Water Works; also for Manufacturing purposes, &c. (Highest duty guaranteed.) Marine and Stationary Engines.

STEAM BOILERS and TANKS. Light and Heavy Forgings, Shafting, Pulleys, Hangers, Mill Work, Iron and Brass Castings, &c.

A large general assortment of Patterns on hand.

Send for Circular Containing List of PRACTICAL ARTICLES
Contributed to the American Machinist by 40 of the best writers.

STOW FLEXIBLE SHAFT CO., Limited,

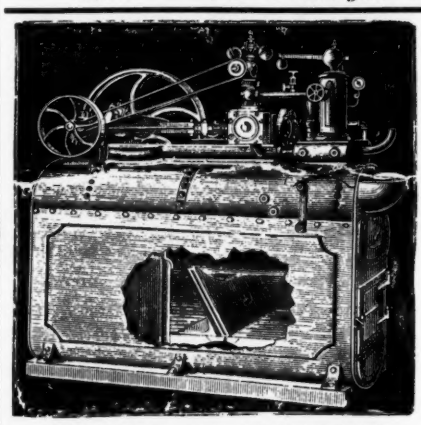
Sole manufacturers for other than dental purposes of the popular

STOW FLEXIBLE SHAFTS

AND TOOLS AND MACHINES OPERATED THEREWITH.

In connection with our newly patented "Round-about Transfer" we command a whole shop from one Countershaft with a tool that is **truly portable,** either for Drilling, Boring, Emery Grinding, Polishing, Brushing, &c., &c. Send for Circular to

1505 to 1509 Pennsylvania Avenue, Philadelphia, Pa.



PORTABLE AND STATIONARY

Engines and Boilers,

2½ to 15 H. P. Return Flue Boiler, large Fire Box, no sparks. Do not fail to send for circular to

SKINNER & WOOD, Erie, Pa.

FRASSE & COMPANY,

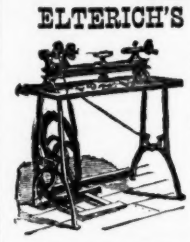
62 Chatham Street New York,

PROPRIETORS OF THE

Briggs, & Leader, Lathes,

SOLE AGENTS FOR

ELTERICH'S TAPS AND DIES,



Comprising the best assortment and largest variety, of threads, from 1-16 to ¼ inch in the United States.
Send for circular.
Importers of STUBS' TOOLS, FILES, and STEEL WIRE, and GROBET FILES.
Agents for the U. S. of Rollason's Patent Steel Music Wire.
No. 0 to No. 32 (Music Wire Gauge) always in Stock.

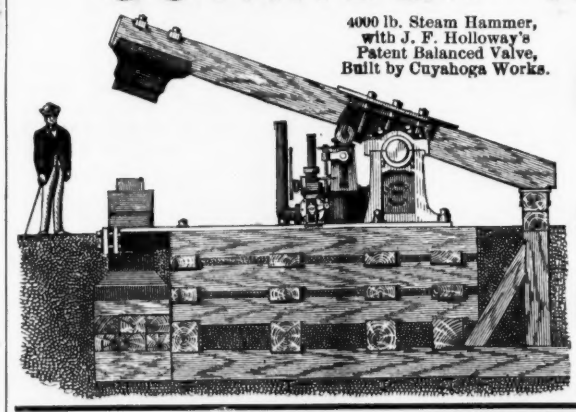
Sole Agents for Chateau's French Emery Paper.

Fine Tools, Files, Steel Wire

Silver Solder for Brazing Band Saws,

AND SUPPLIES FOR MACHINISTS A SPECIALTY.

CUYAHOGA WORKS



4000 lb. Steam Hammer, with J. F. Holloway's Patent Balanced Valve, Built by Cuyahoga Works.

Steam Hammers

LAND AND MARINE ENGINES,

VERTICAL

Blowing Engines,

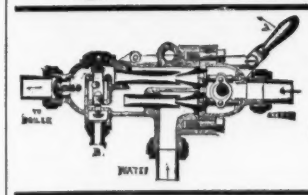
For Blast Furnaces.

Cleveland, Ohio, U. S. A.

KORTING'S

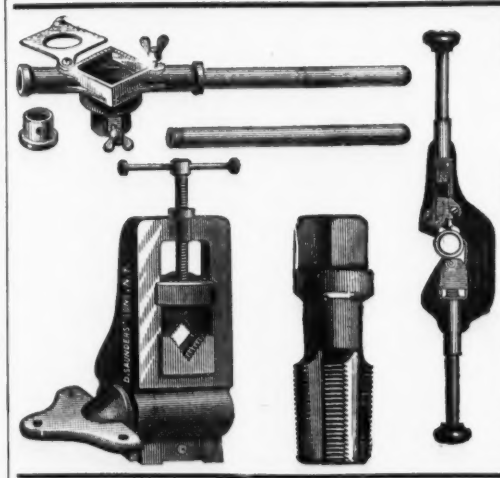
UNIVERSAL INJECTOR,

A COMBINED PUMP AND BOILER FEEDER.



No Adjustment for Variable Steam Pressure. Operated by One Handle. Send for Circular.

A. ALLER, 109 LIBERTY STREET, NEW YORK.



D. SAUNDERS' SONS,

YONKERS, N. Y.

Manufacturers of

STEAM & GAS FITTERS' TOOLS,

ALSO,

THE I. X. L.
NEW PIPE-THREADING MACHINE.

Pipe Cutting and Threading Machines for Pipe Mill Use, &c., a specialty.

SEND FOR CIRCULARS.

THE ECONOMIZER STEAM ENGINE

Has no superiors. Comprises Simplicity, Durability and Economy. Send for catalogues. Also, a large stock of second-hand Steam Engines and Machinery.

S. L. HOLT & CO.
67 Sudbury St., Boston, Mass., U. S. A.

USEFUL BOOKS

Relating to Casting and Founding, Electricity, Electric Light, Engineering, Drawing, Manufacture of Gas, Heat, Indicator Diagram, Link Motion, Mechanics, Screw Cutting, Slide Valve, Steam Boilers, Steam Engines, Steel, Turning, Wire Gauge, Workshop Receipts. Descriptive Catalogue sent promptly on application.

E. & F. N. Spon, 446 Broome St., N. Y.

HORIZONTAL.
VERTICAL
Automatic Cut-off
ENGINES.
Yacht Engines,
Semi-Portable
Engines.

STEEL AND IRON
BOILERS.

All sizes to 225 horse-power.

Send for pamphlet and say where you saw this.

FITCHBURG STEAM ENGINE CO.
Fitchburg, Mass.

NEW OTTO SILENT GAS ENGINE.

Working without Boiler, Steam, Coal, Ashes or Attendance.
Started Instantly by a Match, it gives full power immediately.
WHEN STOPPED, ALL EXPENSE CEASES.
No Explosions; No Fires nor Cinders; No Gauges; No Pumps; No Engineer or other attendant while running.
UNSURPASSED IN EVERY RESPECT for Hoisting in Warehouses, Printing, Ventilating, Running small Shops, etc.
2, 4 and 7 H. P. and upwards. Built by
SCHLEICHER, SCHUMM & CO., 3045 Chestnut Street, Philadelphia.
Boston Agency, HILL, CLARKE & CO., 36 and 38 Oliver Street.
New York City Agency, H. S. MANNING & CO., 111 Liberty Street.

NEW STEAM BOILER TUBE CLEANER.

Manufactured by WILLIAM COOKE, 6 Cortlandt St., New York.
Great Saving of Time and Fuel. Simple, Effective and Economical. Send for Descriptive Circular.

W. BARNET LeVAN,
Mechanical and Consulting Engineer,
3607 Baring St., Philadelphia, Pa.

Headquarters for Machinists' Tools and Supplies.
CHAMPLIN & SPENCER,
154 East Lake Street, - Chicago, Ill.
Sole agents for the "Tanite" Emery Wheels and Grinding Machinery. Dealers in Screw Cutting Lathes from $50 to $150, with foot power, Small Amateur Lathes, Taps and Dies, "Twist Drills," Machine Screws, "Grobet Swiss Files," Machine Bits, Stubs' Steel Wire, Brown & Sharpe Tools, Emery, Crocus and Composition, Rouge, Drop Forged Lathe, Clamp and Die Dogs, Chucks, Wrenches, Hand and Bench Vises, Iron Levels, Metal Saws, Pattern Letters, Pliers, Calipers, Slide Rests, Steel Rules, Micrometer Calipers, Speed Indicators, "Metallic Corrugated Packing" for steam, air, gas or water joints, Steeline for hardening purposes, Upright and Hand Drills, Belting and Packing, Walrus Wheels, "Monk's Moulders' Tools," &c., &c

SECOND-HAND and NEW TOOLS
FOR SALE LOW.
October List No. 1.

Pit Lathe, 31½ ft. swing, will turn a pulley as wide as 9 ft. face.
Pit Lathe, 16 ft. swing, will tnrn a pulley 30 inch face, with gear-cutting attachment.
Lathe, 40 in. swing, 27 ft. bed.
Lathe, 54 in. swing, 26 ft. bed.
Lathe, 100 in. swing, 18 ft. bed.
Lathe, 30 in. swing, 15 ft. bed. New.
Lathe, 18 in. swing, 11 ft. bed. New.
Lathe, 18 in. swing, 8 ft. bed. New.
Lathe, 15 in. swing, 6 ft. bed. New.
Lathe, 28 in. swing, 26 ft. bed.
Lathe, 26 in. swing, 16 ft. bed.
Lathe, 24 in. swing, 15 ft. bed.
Lathe, 21 in. swing, 8 ft. bed.
Lathe, 19 in. swing, 6¾ ft bed.
Lathe, 17 in. swing, 5 ft. bed.
Horizontal Drilling Lathe, 24 in. swing, 19 ft. bed.
Machine for facing and drilling pipe flanges, automatic.
Planer, 32 in. wide, 6 ft. long.
Planer, 26 in. wide, 5 ft. long. New.
Planer, 16 in. wide, 3 ft. long. New.
Planer, 24 in. wide, 6 ft. long.
Planer, 33 in. wide, 5 ft long.
Planer. 32 in wide, 8 ft. long.
Planer, 60 in. wide, 20 ft. long.
Planer, 52 in. wide, 18 ft. long.
Dimension Planer, 24 in. x 13 ft.
Upright Drill Press, 16 in. swing.
Upright Drill Press, 20 in. swing. New.
Upright Drill Press, 36 in. swing.
Upright Drill Press, 48 in. swing.
Suspension Drill.
Upright Boring Mill, 4 ft. between uprights.
Shaping Machine, 16 in. stroke.
Milling Machine. Lincoln pattern.
Gear Cutting Machine.
Profiling Machine.
Boring Bar, 12¾ in. diam., 10 ft long, self-feeding.
Boring Bar, 9 in. diam. 8½ ft. long, self-feeding
Boring Bar, 6 in. diam., 6½ ft. long, self-feeding.
Forcing Machine, for forcing shafts off pulleys.
Two McKenzie Cupolas, 4 ft. x 4½ inside.
No. 7 Sturtevant Blower.
Rattler, Ladles, &c., &c.
Seven Cranes.
Jig Saw.
Saw Tables.
Pattern Makerss' Lathe.

Also a full and complete line of patterns for Corliss Engines, from 10 inch to 40 inch cylinders, and detailed drawings for same.

For Sale by
The George Place Machinery Agency,
121 Chambers and 103 Reade St.,
NEW YORK.

The "Abbe" Bolt Forging Machine,
THE PALMER POWER HAMMER,
Engine Lathes,
And General Machine Tools a Specialty. Address, for circulars and prices,
S. C. FORSAITH & CO.
Machinists and General Machine Dealers,
MANCHESTER, N. H.
Branch Office and Warerooms,
207-209 CENTRE STREET, N. Y. C.

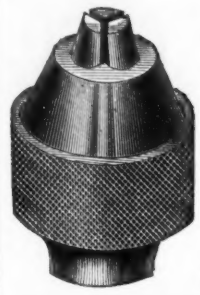
SEND FOR PAMPHLET. THE FAR-FAMED **AMERICAN LUBRICATOR.** TEN THOUSAND IN USE.
AMERICAN LUBRICATOR CO.
DETROIT, MICH. U.S.A.

THE
Wood & Light Machine Co.
Patterns
OF THE FOLLOWING TOOLS ARE FOR SALE AT VERY LOW PRICES:

Engine Lathes from 13 inch to 100 inch swing.
Driving Wheel Lathe, Double Heads, 84 inch swing, and Wheel Quartering Attachment.
Patent Shafting Lathes, 20 inch, 24 inch and 28 inch swing.
Pulley Lathes, 36 inch and 42 inch swing.
Hand Lathes from 12 inch to 20 inch swing.
Chucking and Boring Lathe, 20 inch, 24 inch and 28 inch swing.
Upright Drills from 16 inch to 60 inch swing.
Traverse Drills, 28 inch swing.
Planers, to plane from 24 inches square to 72 inches square.
Shaping Machines from 8 inch to 16 inch stroke.
Slotting Machine, 12 inch stroke, 52 inch swing.
Combined Shaping and Slotting Machine.
Slabbing Machines, three sizes.
Milling Machines, two sizes.
Milling Machines, Double Arms and Spindles.
Profiling Machine, two Spindles.
Boiler Plate Planer.
Quartering Machine for Locomotive Wheels.
Cutting Off and Centering Machine, ¾ to 2½ inch.
Cutting Off and Centering Machine, 1 to 5 inch.

The above Patterns are for sale in one lot or separately, and finished work from these Patterns will be taken in payment, if desired.

The George Place Machinery Agency,
121 Chambers and 103 Reade Sts.,
NEW YORK.



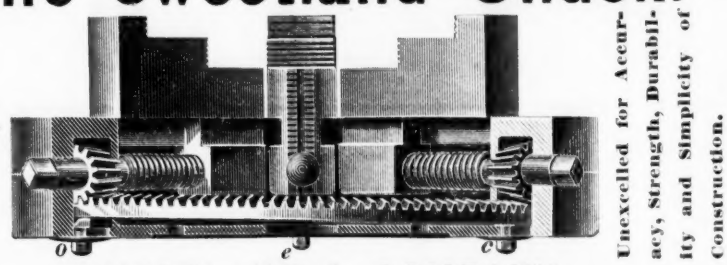
ALMOND
DRILL
CHUCK
Made of Steel throughout, equal to doing any work required of it. Runs perfectly true.
For sale by all Machinists' Supply Stores.
T. R. ALMOND,
84 Pearl Street, Brooklyn, N. Y.

LANE & BODLEY CO.
CINCINNATI, O.
Manufacturers of Wilson's Patent Free Open Double Disk
LEVER VALVE,
for Steam or Water, from 1¼" to 6". This valve has peculiar merits as a throttle valve for steam engines, and is well adapted to the use of a Sawyer's Valve, in place of the butterfly. Send for our catalogue and price list.

"VICTOR"

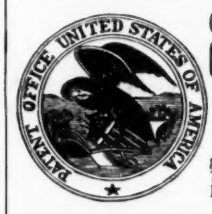
Feed Water HEATER
AND
PURIFIER,
(Patent Nov. 6, 1877.)
For Heating and Purifying Water for Steam Boilers.
Wm. Allen & Sons,
WORCESTER, Mass.

"The Sweetland Chuck."



SWEETLAND & COMPANY,
126 UNION STREET, NEW HAVEN, CONN.

WHITTIER MACHINE CO.
MANUFACTURERS OF
STEEL BOILERS,
Steam Engines and Elevators,
Boston, Mass.: Works, 1176 Tremont St.
N. Y. Office, 120 Broadway.



GEO. C. TRACY & CO
Counselors at Patent Law
EUCLID AVE. BLOCK,
CLEVELAND, O.
Before doing anything in regard to Patents, send for our 140 page book, "ALL ABOUT PATENTS," mailed free.

SECOND-HAND AND NEW
Machinists' Tools.
SEPTEMBER 2d.

One	Engine Lathe,	92 in. x 20 ft.	Wilmoth.
One	" "	90 in. x 20 ft.	Ames. New.
One	" "	30 in. x 20 ft	Good order.
One	" "	30 in. x 16 ft.	Wheeler, new.
One	" "	30 in. x 12 ft.	Ames. New.
One	" "	28 in. x 27 ft.	For shafting. New.
Two	" "	24 in. x 12 ft.	Ames. New.
One	" "	24 in. x 10 ft.	" "
Two	" "	20 in. x 8 ft.	" "
Two	" "	20 in. x 8 ft.	Fifield. New.
One	" "	20 in. x 10 ft.	Fifield. New.
Two	" "	16 in. x 6 ft.	Good order.
One	" "	16 in. x 6 ft.	Bement. Good order
Two	" "	16 in. x 7 ft.	Ames, new.
Three	" "	16 in. x 8 ft.	" "
One	" "	15 in. x 6 ft.	Flathers & Co. New.

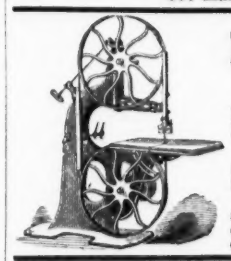
One 52 in. x 36 ft. Lathe.
Two " " 11 in. x 4½ ft. New Spencer.
Four " " 7 in. x 2½ ft. " "
One Planer, 32 in. x 10 ft. Lathe & Morse.
Two " 27 in. x 4 ft. 9 in.
One " 24 in. x 5 ft.
One " 24 in. x 3 ft. 9 in.
Four 9 in. Stroke Shapers, New, Hewes & Phillips.
One Heavy Turret Head Machine.
One 24 in. Drill. Putnam Machine Co.
Six 20 in. " Prentiss, new.
One 5 Spindle Chucking & Drilling Mach. Remington.
One 3 Spindle Pratt & Whitney Drill.
Six Newell Punch Presses.
One No. 3 Wilder Punch Press. Geared. New.
One No. 4 " " " New.
One No. 6 Wilder Shear. Geared, new.
One No. 3 Wilder Bar Iron Cutter. New. Cuts 1½ sq.
One 10 H. P. Baxter Engine.
Seven Stephens' Vises. Also, Parker Vises.
Belting, Shafting and Miscellaneous Machinery.
One Flathers Lathe, 18 in. x 8 ft. Good as new.
One Bement Milling Machine.
One Lincoln " "
Two Garvin " "
One Fowler Press.
One Bliss & Williams Press.

E. P. BULLARD,
14 Dey Street, New York.
General Eastern Agent for
Akron Iron Co's Patent Hot Polished
SHAFTING.

ENGRAVING ON WOOD
MECHANICAL WORK A SPECIALTY.
D. H. TUTTLE, N° 5 BEEKMAN ST. N.Y.

FOR SALE.
A Works completely equipped for the manufacturing of carriage axles; is well located in relation to Coal and Iron, also very accessible to market. Address
E. P. BULLARD,
14 Dey Street, New York.

TAPS & DIES. TOOLS. CHUCKS. TWIST DRILLS. MACHINE SCREWS. LATHES. FILES. STEEL TOOLS. STUBS.
TOOLS for Machinists, Carpenters, Amateurs, Jewellers, Model Makers, Blacksmiths, etc. *Send for Catalogue*, and state *what kind* of Tools you require. **TALLMAN & McFADDEN,**
607 Market St., Philadelphia, Pa.



THE
Rollstone Machine Co.
FITCHBURG, MASS.
Rotary and Stationary Bed Planers, Wardwell's Patent Saw Benches,
Waymouth Lathes,
and large number of special machines.
We also carry a large stock of Second-Hand Machinery Send stamp for Catalogue.

Water Wheel Governor

COHOES IRON FOUNDRY & MACHINE COMP'Y,
COHOES, N. Y.

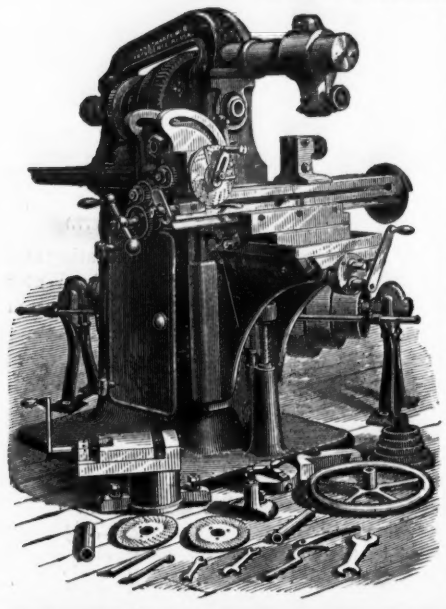
CLARK'S RUBBER WHEELS.

This wheel is the best now in the market, and is attracting the attention of large manufacturers on account of the great saving of floors, which is ten times greater than the extra cost of this wheel.
Adapted to all purposes, viz., warehouse trucks, platform trucks, scales, boxes, baskets and heavy casters. For full particulars, address
GEO. P. CLARK, Windsor Locks, Conn.

BROWN & SHARPE M'F'G CO.

PROVIDENCE, R. I.

MANUFACTURERS OF THE



UNIVERSAL

Milling Machine

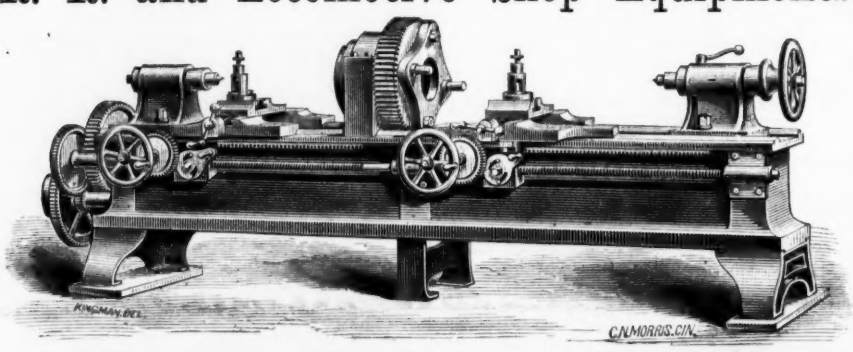
This Machine has been designed especially to meet the wants of Steam Engine and Locomotive builders, and others engaged in the manufacture of heavy machinery and tools.

The essential features and motions are the same as in our smaller Universal Milling Machine, with such enlargement of the whole machine and its parts as would best adapt it for the class of work to be done. The cone has three diameters, each 3½ inches face. In addition, the cone is strongly geared, thus making six changes of speed. There are, also, the same number of changes of feed. The spindle boxes are of hardened cast steel, and, together with the spindle bearings, are carefully ground, and are provided with means of compensation for wear. The spindle will carry a cutter arbor projecting 15 inches, which is supported by an adjustable center at the outer end. Cutters of 8 inches or less diameter can be used. The horizontal movement of the spiral clamp bed upon the knee, in a line with the spindle of the machine, is 6½ inches, and the vertical movement of the spiral bed centers below the spindle centers is 11 inches. The spiral bed can be set at angles of 35° each way from center line of spindle, and can be fed automatically 22 inches, taking also 22 inches between the centers, and will swing 11½ inches.

☞ Illustrated Catalogue sent per mail on application.

CAR WHEEL AND AXLE MACHINERY,

R. R. and Locomotive Shop Equipments.

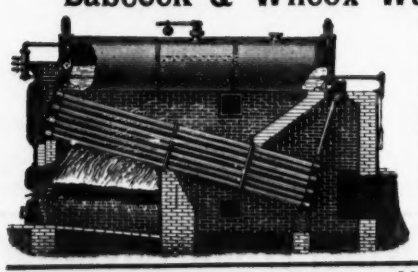


DOUBLE AXLE LATHE.

NILES TOOL WORKS,

HAMILTON, OHIO.

Babcock & Wilcox Water-Tube Steam Boiler.



Adapted for all Purposes. Safe from Explosions.

3,191 H. P. in use by SINGER MF'G CO., New York; 3,030 H. P. by HARRISON, HAVEMEYER & CO., Philadelphia; 2,580 H. P. by DeCASTRO & DONNER SUGAR REFINING CO., Brooklyn; 3,800 H. P. by AMERICAN GRAPE SUGAR CO., Buffalo; 850 H. P. by THE JESSUP & MOORE PAPER CO., Wilmington; 720 H. P. by RARITAN WOOLEN MILLS, New Jersey; 600 H. P. by STUDEBAKER BROS. MF'G CO., South Bend, Ind., and hundreds of others in all kinds of business, from 50 H. P. to 2,000 H. P. each. Centennial Exposition Medal awarded this boiler for highest economy and efficiency on test.

Illustrated Circulars and other desired information promptly furnished.

BABCOCK & WILCOX, Engineers,
30 Courtlandt Street, New York

Emery Wheels & Grinding Machines.

THE TANITE CO.

Stroudsburg, Monroe County, Pa.

Orders may be directed to us at any of the following addresses, at each of which we carry a stock:

London, Eng., 9 St. Andrews, St. Holborn Viaduct, E. C.
Liverpool, Eng., 42, The Temple, Dale St.
Sydney, N. S. W., 11 Pitt St.
New York, 14 Dey St.
Philadelphia, 11 North Sixth St.
Chicago, 189 and 154 Lake St.
St. Louis, 209 North Third St. 811 to 819 North Second St.
Cincinnati, 212 West Second St.
Indianapolis, Cor. Maryland and Delaware Sts.
Louisville, 427 West Main St.
New Orleans, 26 Union St.
San Francisco, 2 and 4 California St.

JAMES W. SEE, Consulting Engineer,

HAMILTON, OHIO.

COPE & MAXWELL M'F'G CO.

HAMILTON, OHIO., U. S. A.

New and Improved Patterns of

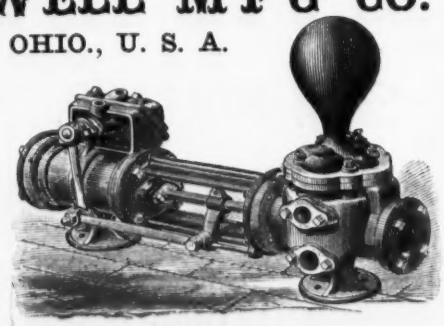
STEAM PUMPING MACHINERY,

FOR

Boiler Feeding, Water Works

and all general and special Pumping purposes.

Send for New Catalogue, illustrating every variety of Pumping Machinery.



THE PRATT & WHITNEY CO.

HARTFORD, CONN., U. S. A.

MANUFACTURERS OF

MACHINISTS' TOOLS,

GUN, AND SEWING MACHINE MACHINERY.

Renshaw Ratchet Drills,

CUSHMAN'S COMBINATION LATHE CHUCKS,

EXTERNAL AND INTERNAL CYLINDRICAL GAUGES,

Newell's Patent Planer Vise.

Send for Illustrated Catalogue and Price Lists.

THE BILLINGS & SPENCER CO.

CHAS. E. BILLINGS, Pres't and Sup't.
L. H. HOLT, Treasurer.
TRADE B MARK.
E. H. STOCKER, Secretary.

HARTFORD, CONN.

MANUFACTURERS OF

PACKER RATCHET DRILLS,

Lathe Dogs, Screw Plates and Dies, Adjustable Screw Wrenches, Barwick Wrenches, Screw Drivers, Billings' Patent Solid Forged Steel Sewing Machine Shuttles, Bobbins, Patent Animal Air Clippers,

AND ALL DESCRIPTIONS OF

STEEL AND IRON DROP FORGINGS

FOR GUNS, PISTOLS, SEWING MACHINES, MACHINISTS' TOOLS, AND MACHINERY GENERALLY.

GOLD MEDAL AWARDED, PARIS EXPOSITION, 1878.

BLISS & WILLIAMS,

PLYMOUTH, PEARL & JOHN STREETS, BROOKLYN, N. Y.

Manufacturers of all kinds of

Presses, Dies and Special Machinery

FOR WORKING SHEET METALS, &c.

FRUIT AND OTHER CAN TOOLS.

Iron Gears of all sizes and kinds made to order.
Brass Gears for Models, etc., on hand in large variety.
Geo. B. Grant, Alden Street,
Send for circular. **BOSTON.**

Steam Pumps,

AIR COMPRESSORS,

Friction Hoisting Engines,

Vacuum Pumps & Condensers,

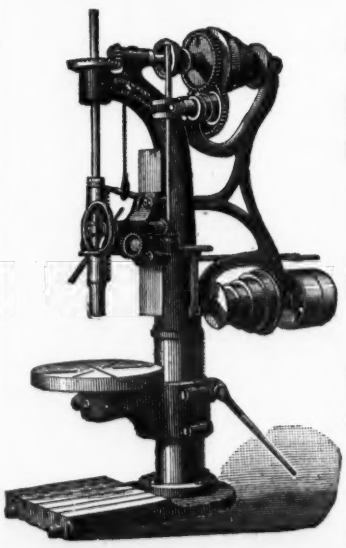
GENERAL MACHINERY

Steam Engines.

Capacity to bore Cylinders 110 Inches Diameter. and turn Fly Wheels of 24 feet.

THE NORWALK IRON WORKS CO.

South Norwalk, Conn.



Engine Lathes, Planers, Drills, &c.

DAVID W. POND, Worcester, Mass.

Send for Catalogue of New Designs.

AIR COMPRESSORS.

PRICES REDUCED. SEND FOR NEW CATALOGUE.

CLAYTON STEAM PUMP WORKS.

14 AND 16 WATER STREET, BROOKLYN, N.Y.

ROP PRESSES

PUNCHING PRESSES,

DIES AND OTHER TOOLS

For the manufacture of all kinds of

Sheet Metal Goods, Drop Forgings, &c.

STILES & PARKER PRESS CO.

MIDDLETOWN, CONN.

J.M.CARPENTER
PAWTUCKET.R.I.

MANUFACTURER OF

TAPS & DIES.